COMMONWEALTH MYCOLOGICAL INSTITUTE

REVIEW
OF
APPLIED MYCOLOGY

VOL. XXIX MAY 1950

DE MONTGRÉMIER (H[ÉLÈNE] A.). **La dissémination du virus X (Marmor dubium, Orton, Holmes) dans les cultures de Pommes de terre. Étude sur le rôle du sectionnement des tubercules.** [The spread of virus X (*Marmor dubium* (Orton) Holmes) in Potato crops. Study on the part played by cutting the tubers.]—*C.R. Acad. Agric. Fr.*, 36 [? 35], 14, pp. 595–597, 1949.

In an experiment carried out at Versailles in 1947, élite class potato tubers were cut in half with a sterile knife, one half being cut again with a knife contaminated with virus X [*R.A.M.*, 27, p. 151; 28, p. 77] by cutting infected tubers or dipping in sap from infected tobacco plants. Five tubers were so cut, after which the knife was re-infected. The cut pieces were planted in the open with *Perrilla nankinensis* in between to prevent contact between the roots and leaves of adjacent potato plants. In June and early July leaf symptoms of mosaic were very rare on the plants from the cut halves, while those from the uncut halves appeared to be healthy. Serological tests in June showed that there were five transmissions in 115 due to cutting, only two (2·66 per cent.) being infected from potato.

In a similar experiment in 1948, only one tuber was cut (instead of five) before reinfecting the knife, and *Atriplex hortensis* was used for screening. Serological reactions, inoculations on tobacco and *Datura stramonium*, and the growth of the tuber progeny showed the percentage transmission to be 2.

It is concluded that the transmission of virus X by the cutting knife is very uncommon and does not play any important part in the spread of the disease.

BÖNING (K.). **Die Durchführung der Verordnung zur Bekämpfung der Viruskrankheiten der Kartoffel.** [The execution of the Order for the Control of Potato Virus Diseases.]—*Pflanzenschutz*, 1, 7, pp. 77–78, 1949.

The provisions of the Order for the Control of Potato Virus Diseases in Bavaria of 14th February, 1949 are briefly discussed, with special reference to the need for co-operation between the local authorities and plant pathologists in such matters as the registration of peach trees and treatment against the aphid vector [*Myzus persicae*] and the detection of severely degenerated stands within the 'closed' 'seed'-producing areas.

The paper is preceded by an official explanatory note on the Order (which was published in the Bavarian Official Gazette of 16th March, 1949), pointing out that prior to 1945 Bavaria annually imported 60,000 to 70,000 tons of potatoes from eastern Germany, especially Pomerania. This source of supply is now closed and the resultant deficit must be made good from home-grown stocks. The Bavarian moorlands and sandy soils are eminently adapted to seed production, and should yield a sufficiency, not only for the province itself but also for export, provided the virus diseases responsible for degeneration are effectively combated. In second- and third-year crops they may cause losses equivalent to between 30 to 50 per cent. of a normal harvest.

Köhler (E.). **Die Lehre vom oekologischen Kartoffelabbau.** [The principles of ecological Potato degeneration.]—*NachrBl. biol. ZentrAnst. Braunschw.*, 1, 10, pp. 142–144, 1949.

This is a critical exposition and discussion of the ecological theory of potato degeneration [*R.A.M.*, 14, p. 387], the arguments in favour of which are dismissed as untenable. For practical purposes, degeneration can be equated with virus infection, but if a distinction must be made between this form and physiogenic deterioration, the modest part played by the latter should be clearly emphasized.

Salaman (R. N.). **Disease-resistance in Potatoes : an historical note.**—*Emp. J. exp. Agric.*, 17, 68, pp. 238–244, 1949.

The author outlines the history and development of research on potato varieties resistant to wart [*Synchytrium endobioticum*], blight (*Phytophthora infestans*), and various virus diseases, with special reference to the work done by the Potato Synonym Committee in elucidating the confusion existing among named potato varieties.

Müller (K. O.) & Börger (H.). **Experimentelle Untersuchungen über die Phytophthora-Resistenz der Kartoffel. Zugleich ein Beitrag zum Problem der "erworbenen Resistenz" im Pflanzenreich.** [Experimental studies on the *Phytophthora* resistance of the Potato, together with a contribution to the problem of 'acquired resistance' in the plant kingdom.]—*Arb. biol. Anst. (Reichsanst.), Berl.*, 23, 2, pp. 189–231, 7 figs., 1 diag., 1 graph, 1941. [Received October, 1949.]

The following are some of the principal conclusions reached on the basis of experimental studies designed to elucidate important problems in the 'mechanism' of varietal resistance to potato blight (*Phytophthora infestans*) [*R.A.M.*, 22, p. 162; 28, p. 414]. The premature death of the parasite on the tubers of the resistant W varieties is attributable neither to the previous existence therein of a toxic principle nor to the absence of any nutrient material indispensable to the growth of the fungus, but to an alteration in the host cells coming into contact with the latter. The hypothetical substance [loc. cit.] responsible for the defence reaction is not specific to *P. infestans* but acts in a similar manner on other potato pathogens, e.g., *Fusarium caeruleum*, and saprophytes. The defence reaction is restricted to the tissue colonized by the fungus and its immediate vicinity, and does not confer immunity on the entire organ. In contrast to the immunization of the infected tissues in resistant varieties, the host cells of susceptible ones attacked by a virulent race of *P. infestans* gradually acquire susceptibility to organisms innocuous to intact tubers.

A chapter is devoted to a discussion of the problem of the applicability to these experimental data of the theoretical premises postulated for the explanation of immunity phenomena in animals. The question of 'innate' or 'acquired' resistance, propounded as alternative formulations, is regarded as idle, since both contain elements of truth.

Müller (K. O.). **Neuere ausländische Arbeiten zur Züchtung Phytophthora-fester Kartoffelsorten (1939–1949). Sammelreferat.** [Recent foreign contributions to the breeding of *Phytophthora*-immune Potato varieties (1939–1949). Collective report.]—*Z. PflZücht.*, 28, 2, pp. 210–229, 1949.

In this critical survey of 63 non-German contributions to the development of immunity from blight (*Phytophthora infestans*) in potatoes, published between 1939 and 1949, the author classifies the studies in five sections, namely, (1) efforts to discover new sources of breeding material; (2) assessment of the degree of resistance;

(3) investigations and statements on the problem of physiologic specialization in *P. infestans*; (4) heredity of resistance to blight; and (5) new blight-resistant potato varieties. Most of the papers have been noticed in this *Review* [see preceding abstract].

RAUCOURT (M.), LANSADE (M.), & VENTURA (E.). **Essais de traitement du mildiou de la Pomme de terre (Phytophthora infestans (Mont.) de Bary) en 1948.** [Spraying trials against Potato blight (*Phytophthora infestans* (Mont.) de Bary) in 1948.]—*Parasitica*, 5, 4, pp. 89–104, 5 graphs, 1949.

During 1948, when conditions in France were very favourable to the development of potato blight (*Phytophthora infestans*) [*R.A.M.*, 26, p. 26], experiments were carried out at Versailles and Attigny in the Ardennes to determine the minimum amount of copper salts which would control the disease. The need for these experiments was brought about by economic conditions which necessitated the reduction of labour costs by reducing the number of treatments.

The results indicated that at least two applications of 2 per cent. Bordeaux mixture were needed to give thorough protection to the leaves. When treatments were applied on June 21st and July 9th the percentages of foliage remaining on August 16th and 27th were 92·5 and 51·6, respectively, compared with 41·5 and 23·3 per cent., respectively, when the June treatment alone was applied. In a severe epidemic several weak mixtures (125 to 250 gm. copper per hl.) would need to be applied.

Dusts were effective only when they contained 20 per cent. copper or more. At present they should be used only as a complement to spray treatments. The quantitative analysis of copper on treated leaves indicated that the relative inefficiency of the dusts in relation to the copper mixtures was due to the fact that they deposit less copper per unit of surface area than the mixtures.

CASSERES (E. H.). **Las Papas—importancia del abono y variedades resistentes en su producción.** [Potatoes—importance of the fertilizer and resistant varieties in their production.]—Reprinted from *Hacienda*, *N.Y.*, 1 p., 3 figs., 1948. [Received October, 1949.]

In tests conducted at the Inter-American Institute of Agricultural Sciences, Turrialba, Costa Rica, in 1945, of a number of selections resistant to blight (*Phytophthora infestans*), developed at the Cornell (New York) Agricultural Experiment Station, EVI2 proved to be the best, while others showing promise in current trials include Harford and Fillmore.

MALMUS (N.). **Die Kraut- und Knollenfäule der Kartoffeln.** [Potato blight.] —*Pflanzenschutz*, 1, 10, pp. 117–119, 1 fig., 1949.

In contrast to the elaborate and costly organization which has been set up in Germany for the elimination of potato virus diseases, the measures hitherto adopted for control of blight (*Phytophthora*) [*infestans*] are totally inadequate. The losses due to the latter disease have been reliably estimated at 33 and 25 per cent. for the epiphytotic years of 1916 and 1926, respectively, and at 10 per cent. for less virulent outbreaks. Following the 1845 pandemic [*R.A.M.*, 29, p. 46], yields in Germany dropped from 229 doppelzentner [1 dz. = 100 kg.] per ha. to 76·4 dz. Even from 1934 to 1943 the average was under 170 dz. The 1926 harvests in Bavaria and the southern districts of Baden and Württemberg were the lowest in all Germany (70 dz. per ha.).

The symptoms of the disease are described. The sudden onset characteristic of its most serious form presupposes, in addition to the presence on the leaves of liquid water and an optimal degree of warmth (16° to 24° C.), that a favourable stage has been reached in the development of the host, which should have passed

the flowering period. Early varieties, therefore, are subject to specially heavy infection by *P. infestans*, whereas in later ones, which do not pass into the susceptible phase until August or September, when the temperatures are beginning to fall, the pathogen generally assumes an insidious form, making slow but steady progress and causing a reduction in yield.

The use of blight-resistant varieties [ibid., 22, p. 271 and above, p. 226] meets with difficulties on account of the segregation of the fungus into about ten physiologic races [cf. ibid., 25, p. 138 *et passim*]. However, not all the individual races are equally prevalent, so that clear-cut differences are apparent between certain varieties in their reaction to infection, Böhms Mittelfrühe, for instance, being less susceptible than Flava and Bona maturing at the same time.

Losses from blight are not completely preventable by any practicable prophylactic measures, and so far as is known at present, treatment with copper-containing fungicides alone confers protection. Bordeaux mixture (1 to 2 per cent.) and copper sprays containing 45 per cent. copper (0·5 to 0·75 per cent.) are used. In general, the low-strength mixtures are preferable, three treatments being given at two- to three-weekly intervals. However, for the rapidly maturing early varieties, which require only two treatments at the most, a high-strength preparation should be used. The spray consumption is reckoned at 800 to 1,000 l. per ha., and the daily capacity of a horse-drawn and knapsack apparatus at 6 and 0·5 ha., respectively. The total cost for labour and materials of three applications is about 40 DM., and a 10 per cent. increase in yield should result in a corresponding financial gain of 150 DM.

Alfaro (A.). **Una antracnosis de la Patata.** [An anthracnose of the Potato.]—*Bol. Pat. veg. Ent. agríc., Madr.*, 15, pp. 61–70, 8 figs., 1947. [Received January, 1950.]

In the autumn of 1945, samples of diseased potato plants were submitted for examination from the districts of Alava, Burgos, and Palencia, and in September 1946, further specimens of the same kind were received. They were found to be infected by *Colletotrichum atramentarium* [*R.A.M.*, 28, p. 538], the only previous references to which in Spain were made by Lázaro Ibiza (as *Vermicularia maculans*: Compendio de la Flora española, Vol. I, 1920), and (as *V. maculans* f. *hispanica*) by González Fragoso (*Trab. Mus. nac. Cien. nat.*, Ser. bot., 9, 1916) and Unamuno [*R.A.M.*, 12, p. 788]. The symptomatology, morphology, and parasitism of the fungus are described, with a brief note on control by crop rotation and seed treatment with formalin [ibid., 5, p. 447].

Saran (A. B.). **Some observations on an obscure disease of Paddy : Oryza sativa.**—*Curr. Sci.*, 18, 10, pp. 378–379, 1949.

An obscure disease of rice is widespread in Bihar, India, where it is known by various local names, e.g., 'dakhina', 'ufra', and 'chatra'. Foliar chlorosis and apical shrivelling gradually spread downwards and the plants ultimately present a withered appearance. Substantial reductions of yield may be sustained, amounting in severe cases to a complete loss of grain.

The disease was observed at the rice experimental area at Sabour in a few plots during a year of high flood, a condition favouring its development according to local opinion. The experimental application of chemical compounds to one of these plots resulted in the following yields: bazaar sodium sulphate 1,726 lb. (increase of 94·5 per cent.), sodium sulphate 1,678 (89·1), aluminium sulphate 1,505 (69·6), ammonium sulphate 1,701 (91·7), ammonium chloride 1,041 (17·3), and sodium chloride 1,002 (12·9) compared with 887 lb. per acre for the control. Sulphate deficiency in the diseased plots was revealed by soil analysis, and as early as 1913 Woodhouse (Crop pest handbook for Bihar and Orissa) reported the beneficial

effect of bazaar sodium sulphate on the disease. In these experiments diseased plants uprooted and replanted in a healthy plot rapidly recovered, whereas those transferred to deficient soil quickly deteriorated. There was no sign of the implication of any pathogenic agency.

BORGET (M.). **Nouvelles recherches sur les champignons parasites de l'Hévéa en Indochine.** [Further studies on the fungi parasitic on *Hevea* in Indo-China.]—*Rev. Bot. appl.*, 29, 317–318, pp. 117–123, 1 graph, 1949.

A survey of *Hevea* rubber trees at Laikhê, Indo-China, during 1946 indicated that susceptibility to *Corticium salmonicolor* [*R.A.M.*, 26, p. 28] was influenced by the origin of the plant material. Among clones of known origin most commonly planted in that region B. 84, TJ. 1, and TJ. 16, were classed as most susceptible, and RR. 107, W. 4, G. 1, and AV. 50 as resistant. Among those of unknown origin TJ. 1 ill(egitimate), and AV. 152 ill. were susceptible and AV. 163 ill. resistant. Close planting reduced the severity of the disease among four-year-old trees. Plantations receiving less rainfall and having a well-defined dry season also suffer less damage from the disease.

In cultures made at the I[nstitut des] R[echerches sur le] C[aoutchouc en] I[ndochine] on sterilized *Hevea* cortex, rice, maize meal agar and Czapek–Dox, carrot slices, and a semi-synthetic medium with *Hevea* cortex, certain cultures and strains formed mycelial 'aggregates' which were red at first, turning a dirty red or even brown with age. The aggregates were compact, not divided into individual spores, and in section they revealed a tissue structure. A 7 per cent. copper sulphate mixture gave adequate control of the disease in a 12 ha. block of six-year-old TJ. 1 rubber trees at Laikhê, treated from September to November at three-week intervals. A further preventive treatment made at the end of the dry season may also be advisable.

Although less widespread than *C. salmonicolor*, stripe canker caused by *Phytophthora palmivora* [loc. cit.] causes much damage in certain plantations and to certain clones, notably BD. 5. An experiment in which 22 clones were artificially inoculated with the organism, established that BD. 5, [ibid., 27, p. 541] and IR. 1 are very susceptible; B. 16, AV. 274, BD. 1, and D. 65, susceptible; R. 424, TJ. 1, SR. 9, PB. 86, and AV. 188, medium susceptible; and AV. 49, PR. 107, B. 84, and AV. 163 resistant.

Similar artificial inoculations with *Gloeosporium albo-rubrum* [ibid., 11, p. 432; 12, p. 77], which is fairly widespread in Indo-China, showed clones B. 84, BD. 5, and PB. 25 to be among the most susceptible and PB. 86 among the most resistant. In general only seriously weakened trees and those planted in brown soils are attacked.

Although several cases of *Fomes lamaoensis* [*F. noxius*] and other root rots have been found in the course of examinations they are not of practical importance owing to the slow rate of spread.

In a series of laboratory tests paranitrophenol proved most efficient against *Botryodiplodia theobromae* (0·005 per cent.).

GOODALL (D. W.). **Studies in the diagnosis of mineral deficiency. VI. The composition of weed leaves in relation to potassium deficiency in Barley.**—*Ann. appl. Biol.*, 36, 3, pp. 352–363, 1 graph, 1949.

In further studies of mineral deficiency [*R.A.M.*, 28, p. 282] spectrographic analyses were made of the leaves of the weeds growing in barley fertilizer trials in Hampshire. It is tentatively concluded that applications of muriate of potash are likely to increase grain yield of barley only where the leaves of *Polygonum convolvulus* contain under 1·83 per cent. potassium.

RAMAKRISHNAN (T. S.) & RAMAKRISHNAN (K.). **Ergot on Bamboo.**—*Curr. Sci.*, 18, 9, pp. 344–345, 3 figs., 1949.

From the sheaths of several of the topmost leaves on clumps of *Bambusa* sp. near Gudalur, Nilgiris, projected whitish to dark greenish-brown, elongated, curved or twisted sclerotia up to about 1 in. in length, covered in some cases with a creamy-white, semi-solid mass resembling the sphacelial stage of *Claviceps*. Sections through these bodies revealed a white core composed of a compact mass of hyphal cells, surrounded towards the periphery of the sclerotium by a dark layer. Outside the latter the hyphal plexus gave rise to labyrinthine folds and depressions, lined by palisade-like, cylindrical conidiophores from which were successively abstricted elongated, fusiform, hyaline, unicellular conidia, 4 to 10 by 2 to 4 (7 by 3) μ. They germinated when floated on water, mostly by lateral germ-tubes. The hyphae permeated the young stem tissues at the tip of the branch, and on emergence they formed a whitish basic stroma, eccentrically placed between the sheaths and the stem on the side where the former opened. From this base arose the sclerotia described above. The older ones developed longitudinal fissures.

Fresh sclerotia exhaled the characteristic odour of *C. purpurea*, and the assay of powdered material revealed traces of alkaloids [*R.A.M.*, 24, p. 230]. Tempère has reported infection of *Phyllostachys nigra* flowers by *C. purpurea* from France [*Actes Soc. linn. Bordeaux*, 85, p. 50, 1933], but this is not the species under discussion, as shown by differences in the conidia. Species of *Claviceps* have hitherto been found exclusively on the floral organs and not before on bamboo in India.

MCMARTIN (A.). **Fungicidal treatment for Sugar Cane cuttings. Summary of recent trials.**—*S. Afr. Sug. J.*, 33, 10, pp. 651, 653, 655, 1949.

In a glasshouse trial at the Mount Edgecombe Experiment Station, Natal, the following fungicides, applied for pineapple disease [*Ceratostomella paradoxa*] control [*R.A.M.*, 27, p. 157] significantly increased the germination percentage of Co. 231 sugar-cane over the untreated (6), the following values being obtained: 0·5 per cent. phygon, 63; 0·5 per cent. aretan [cf. ibid., 27, p. 542], 57; 0·5 per cent. dowicide H, 55; 0·12 per cent. hortosan D.P., 55; 0·06 per cent. hortosan D.P., 53; 0·5 per cent. abavit S, 51; 1 per cent. R. 1334×14, 48; 1·5 per cent. leytosan, 39; 0·2 per cent. verdasan, 39; and 1 per cent. agrosan GN, 35. Hortosan D.P. at 0·12 per cent., R 1334×14, phygon, and abavit S also produced highly significant increases in shoot weight (904, 774, 678, and 604 gm., respectively, as against 44 gm. for the untreated), while increases at a lower level of significance were given by aretan (560), agrosan GN (532), dowicide H (470), and verdasan (466). These results again demonstrated the value of an effective fungicidal treatment under planting conditions which would normally be considered too dry.

In a field test, using 25 four-budded setts of N: Co. 310 per plot and replicating each treatment six times, the following produced a highly significant increase in germination over the control (67·6 per cent.): abavit S, 86·3; agrosan GN, 84·3; solanosan, 83·3; 0·12 per cent. hortosan D.P., 80·6; and R. 1334×14, 80·6; and there was a less significant improvement (79·3) with leytosan. Phygon and dowicide H were not included in this trial. Agrosan GN, solanosan, and abavit S also produced significant increases in the number of shoots after a growth period of 3½ months, viz., 505, 490, and 472 per plot, respectively, as against 324 in the untreated.

In a further trial on the same lines as the foregoing, 0·2 per cent. R. 1412×157, the same at 1 per cent., and aretan increased the germination percentage from 57 to 87, 82, and 81, respectively, the corresponding value for agrosan being 78. Rainfall was more abundant in this test, and the controls showed 46 per cent. infection by *C. paradoxa*, which was reduced to 3 per cent. by R. 1412×157, to 10 per cent. by agrosan GN, and to 13 per cent. by aretan.

Esfandiari (E.). **Troisième liste des fungi ramassés en Iran.** [Third list of fungi collected in Iran.]—*Ent. Phytopath. appl., Tehran, 1948*, 8, 16 pp., 1949. [Persian, with French summary on pp. 1–12.]

Some of the records in this further instalment of the author's annotated list of Persian fungi [*R.A.M.*, 26, p. 356] have already been noticed from another source [ibid., 28, p. 378]. *Claviceps paspali* [ibid., 29, p. 217] occurs on *Paspalum cruciforme*; *Sphacelotheca cruenta* on sorghum; *Ascochytella citri* on lemon; *A. hyoscyami* on *Hyoscyamus niger*; *Septoria alliina* on chives; *S. lactucae* on lettuce [ibid., 21, p. 182 *et passim*]; *Fusicladium* [*Venturia*] *cerasi* on cherry; and *Monilia* [*Sclerotinia*] *fructigena* on pear.

Favre (J.), Kellenberger (E.), & Weigle (J.). **Possibilité d'emploi du microscope électronique pour l'étude des spores de champignons.** [Possibility of application of the electron microscope to the study of fungus spores.]—*Bull. schweiz. Akad. med. Wiss.*, 4, 4, pp. 275–279, 8 figs., 1948.

The electron microscope, with a resolving capacity 100 times greater than that of the optical, has given interesting results in the study of fungus spores and may well prove useful as an aid to the precision required in the description of these organs for taxonomic purposes. The figures chosen to illustrate this preliminary note depict the spores of (1) *Pleurotus mitis*, (2) *Lepista inversa* [*Clitocybe flaccida*], (3) *Bovista nigrescens*, (4) *Collybia pseudoclusilis*, (5) *Penicillium* conidia, (6) the rupture of a *Penicillium* conidium under electronic bombardment, (7) and (8) spores of *Pleurotus mitis* and *C. flaccida* treated with distilled water.

McKinney (H. H.) & Fulton (R. W.). **Local susceptibility of cotyledons and leaves of Cucumber to Tobacco mosaic virus.**—*Phytopathology*, 39, 10, pp. 806–812, 1 fig., 1949.

Cucumbers have long been known to be free from systemic infection by the tobacco mosaic virus, and were apparently assumed to be also immune from local attacks. It appears, however, from the results of two independent series of experiments, one conducted at the Bureau of Plant Industry, Beltsville, Maryland, and the other at the Wisconsin Agricultural Experiment Station during the past four years that the capacity for local infection of cucumber foliage is a fairly general property of this virus and its strains. Past failures to observe the phenomenon may have been due to the fact that the local lesions are not always conspicuous on the cotyledons unless the concentration of virus in the inoculum is reasonably high. The mild dark green virus, collected on *Nicotiana glauca* in the Canary Islands [*R.A.M.*, 9, p. 260] and regarded as more distantly related to the tobacco mosaic virus than an ordinary mutant, also induced local infection on cucumber cotyledons in these trials. The tobacco mosaic virus and a new strain, KC, isolated from severely stunted field-grown tobacco plants with numerous small, necrotic spots on faintly mottled leaves, were also inoculated into the cotyledons of melons and various types of *Cucurbita pepo* with positive results. It would appear from these data that cucumber and certain other cucurbits are of more value than hitherto supposed for the identification of the tobacco mosaic virus and some of its mutants and more remote relatives.

Couch (J. N.). **A new group of organisms related to Actinomyces.**—*J. Elisha Mitchell sci. Soc.*, 65, 2, pp. 315–318, 1949.

The author gives a preliminary description of some organisms discovered in water cultures of soil being examined for water moulds and chytrids. They belong in the Actinomycetales but produce zoosporangia and zoospores which develop on boiled *Paspalum* grass leaves and certain other substrata after about ten days.

They usually develop close to the surface of the water terminally or laterally on short stalks which may project above, or grow beneath the surface. The spherical sporangia from 5 to 20 μ in diameter may remain in a resting stage but when disturbed spore formation takes place in from half to one hour. The spores may be arranged in a distinct spiral in the sporangia in some species. Liberation is by the gradual, complete dissolution of the sporangial wall, by partial dissolution, or by an irregular opening in the wall. The spores swim freely for a few minutes to several hours by means of a single, anterior, basally thickened flagellum. The mycelium is delicate and richly branched on boiled *Paspalum* grass leaves; one species formed short, twisted aerial hyphae.

In one of the species isolated, sporangia were formed on some agars and on *Paspalum* grass leaves in water but the spores set free were non-motile. The aerial hyphae produced are similar to those in *Streptomyces*. The sporangial forms seem closest to *Micromonospora* from vegetative characters alone. The author distinguishes *Streptomyces* and *Micromonospora*, the former having a characteristic, aerial mycelium, which gives agar colonies a myceloid or dusty appearance, and spores in chains on aerial hyphae, while in the latter aerial mycelium is lacking or produced sparingly and the colony surface is wet and slimy, the spores being formed singly on the ends of the hyphae or in small clusters. The type species of this genus is *M. chalceae* Foulerton.

Sacco (P.). **Mineral absorption and resistance to wildfire in Tobacco.**—*Publ. Pa St. Coll.* 901, 86 pp., 10 pl., 8 graphs, 1946. [Mimeographed.]

Investigations were carried out in Pennsylvania during 1940–42 and 1945 into the possible relationship between supply of mineral nutrients and susceptibility of tobacco to wildfire [*Pseudomonas tabacum*: *R.A.M.*, 19, p. 47]. The technique employed was a modification of that used by Hoagland [ibid., 29, p. 181]. In the earlier experiments, the plants were most susceptible to inoculation with the wildfire organism when grown under conditions of low potassium, while resistance was favoured by a combination of high potassium with either high or low nitrogen and lower calcium.

In 1945 again most disease was associated with low potassium, high calcium, and high nitrogen in the culture solution. An analysis of the leaves of the plants receiving this treatment revealed a low calcium intake, indicating an interrelationship of calcium and potassium at high nitrogen levels.

When the potassium supply remained constant and adequate and the calcium concentration of the solution was altered from sub-minimum to maximum, disease was most severe when the leaves contained high potassium and nitrogen and the lowest quantities of calcium, indicating that the latter can be considered to be at least as important in bringing about resistance as potassium was in all previous experiments. Almost as much disease occurred in the low calcium culture as at the other five levels combined.

Under conditions of high nitrogen and high potassium, the intake of ions of the former into the leaves is retarded. Lowering the potassium concentration permitted a greater accumulation of nitrates.

A tentative statistical study indicated that if the important factor of homogeneity could be discounted, for each 1 per cent. increase in the calcium content of the leaf there was 8·7 per cent. less disease.

Steinberg (R. A.), Bowling (J. D.), & McMurtrey (J. E.). **A possible explanation of symptom formation in Tobacco with frenching and mineral deficiencies.**—*Science*, 110, 2870, pp. 714–715, 1949.

In further studies at Beltsville, Maryland, of tobacco growth abnormalities [*R.A.M.*, 27, p. 263] frenching [ibid., 28, p. 646] of oriental Xanthi tobacco was

obtained with *dl*-isoleucine at 20 p.p.m. in water culture, though in partially sterilized soil very large amounts were required to produce the symptoms in Connecticut Broadleaf and Xanthi tobacco. Large-scale analytical studies with field plants of Maryland Medium Broadleaf tobacco gave some confirmation of the view that excessive accumulation of free amino acids in the plant may be a primary cause of symptom formation in certain abnormalities. Free amino acids in leaf laminae of mildly frenched plants increased to a maximum of 121 per cent. above normal, while in plants with deficiency symptoms they increased with nitrogen, phosphorus, potassium, calcium, magnesium, or boron deficiency. The increases indicate that symptom formation is primarily due to the localized action of excessively accumulated normal metabolites. Growth responses and chloroses with amino acids are sufficiently varied to include many of the individual symptoms comprising the syndromes expressed with mineral deficiencies. The probable participation of the chemical elements in the enzymes regulating protein metabolism warrants the exercise of caution in associating specific mineral deficiencies with physiological processes in the plant.

Locke (S. B.). **Resistance to early blight and Septoria leaf spot in the genus Lycopersicon.**—*Phytopathology*, 39, 10, pp. 829–836, 1949.

As already reported, the differences in susceptibility to early blight (*Alternaria solani*) and *Septoria* leaf spot (*S. lycopersici*) in 15 commercial tomato varieties tested in the laboratory at the Arkansas Agricultural Experiment Station were slight but statistically significant [*R.A.M.*, 28, p. 255]. The results of laboratory and field tests on 69 importations of *Lycopersicon* from South America in search of a source of resistance for breeding purposes, a preliminary note on which has already appeared (abs. in *Phytopathology*, 32, p. 12, 1942), are described, tabulated, and discussed. Some measure of resistance was observed in accessions belonging to all the five species represented, namely, *L. hirsutum*, *L. glandulosum*, *L. peruvianum*, *L. esculentum*, and *L. pimpinellifolium*. The maximum degree of resistance to either disease was found among the ten strains of *L. hirsutum*, one of which (P.I. No. 127827) proved highly resistant to both *A. solani* and *S. lycopersici*.

Jacks (H.). **Soil disinfection. VII. Comparative value of formaldehyde and of paraformaldehyde in control of Verticillium-wilt. VIII. Chemical control of Verticillium-wilt of Tomatoes.**—*N.Z. J. Sci. Tech.*, A, 30, 2, pp. 115–118, 118–123, 1948. [Received December, 1949.]

In investigations in New Zealand in 1945 to determine the comparative toxicity of formaldehyde and paraformaldehyde to *Verticillium albo-atrum*, the agent of tomato wilt [*R.A.M.*, 24, p. 390; 28, p. 255], isolations from affected plants were grown on a mixture of oatmeal and sand, at 25° C. When the fungus had grown through the medium the inoculum was mixed with steam-sterilized potting soil at the rate of six dishes (3 oz. per dish) of inoculum per cu. ft. soil and after three weeks placed in boxes of $\frac{1}{3}$ cu. ft. capacity. Ground paraformaldehyde tablets, dissolved in warm water, and formalin (40 per cent. formaldehyde) were watered on to the soil at the rate of $\frac{1}{2}$ gal. per box at concentrations from 0·1 to 3·2 per cent. with $\frac{1}{2}$ gal. water only for the controls. After 21 days 24 Break O'Day tomato plants were planted in each box.

The results showed that formaldehyde at 0·8 per cent. and more and paraformaldehyde at 1·6 per cent. and over gave satisfactory control. Soil treated with the latter could be safely planted one week earlier than that treated with equal dosages of formaldehyde. Neither material damaged plants set out three to four weeks after treatment.

The second paper deals with the control of *V. dahliae* [ibid., 28, pp. 37, 493] by soil fumigants. Infested potting soil was treated with chloropicrin (5 ml. per cu. ft.)

and kept for 48 hours in closed containers, transferred to boxes, and planted 14 days after treatment with Kondine tomato plants. Fourteen weeks after planting, the untreated and treated had 87·25 per cent. diseased and 100 per cent. healthy plants, respectively. A soil application of chloropicrin (2 ml. per sq. ft.) seven days before planting in commercial glasshouse, where there had been 25 per cent. infection in the previous crop, resulted in 6·2 per cent. infection in Potentate tomato plants and 7 lb. fruit, compared with 48·5 per cent. and 4·9 lb. fruit for the untreated plants.

In 1945, light volcanic loam in a glasshouse was artificially infected and formalin solutions applied at 33·6 ml. per sq. ft., while chloropicrin and DD [dichloropropene-dichloropropane] were injected 5 in. deep at 2 ml. per sq. ft. The treatments were made on 22nd June, and Potentate plants set out on 12th July. On 4th February, 1946, the untreated plots averaged 45·55 per cent. infected plants with 5·68 lb. fruit per plant, the corresponding figures for chloropicrin, DD, and formalin being 7·63 per cent. and 8·19 lb., 18·72 per cent. and 6·99 lb., and 15·8 per cent. and 6·01 lb. Next season the same treatments repeated averaged, respectively, 62·49, 6·1, 23·79, and 8·51 per cent. infection.

When infected potting soil was treated with fumigants in air-tight containers only chloropicrin (6 ml. per cu. ft.) gave good control.

Soil under glass which had previously grown an infected crop was treated with chloropicrin (2 ml. per sq. ft.), iscobrome 2 [ibid., 26, p. 341; 27, p. 305] (3 ml.), a mixture of chloropicrin and DD (1:1, at 2 ml.), and a mixture of iscobrome 2 and chloropicrin (2:1, at 3 ml.); the mean percentages of infected plants were, respectively, 20, 15·5, 8·33, and 4·17, as compared with 67 per cent. infection for the untreated.

Szántó (I.). **A Bükkfa rákja mint éghajlati betegség.** [Beech canker as a climatic disease.]—*Erdész. kiséri.*, 48, 1–2, pp. 10–31, 1948. [Abs. in *For. Abstr.*, 11, 1, p. 114, 1949.]

A beech disease in Zala county [Hungary] is due to a species of *Nectria*, infection by which originated primarily in bark breaks (in 1920–1) probably caused by an exceptionally warm, dry period in winter and spring, followed by a cool, rainy spell throughout June and July.

Pimentel (A. A. L.). **A Phytophthora cinnamomi Rands, um outro agente, extremamente virulento, da 'doença da tinta' do Castanheiro.** [*Phytophthora cinnamomi* Rands, another extremely virulent agent of the Chestnut ink disease.]—*Agron. lusit.*, 9, 3, pp. 181–191, 1947. [Received November, 1949.]

On the basis of further experiments and a study of the relevant literature, the author has reached the conclusion that *Phytophthora* A, an extraordinarily virulent agent of chestnut ink disease in Portugal [*R.A.M.*, 28, pp. 365, 494], is identical with *P. cinnamomi* [ibid., 24, p. 295 and next abstracts]. Besides its extreme pathogenicity, *P. cinnamomi* is capable of spreading considerable distances and has a wide host range, the principal economic species attacked being chestnut and cork oak (*Quercus suber*).

Urquijo Landaluze (P.). **Revisión taxonómica de los hongos productores de la enfermedad del Castaño llamada de la 'tinta'.** [Taxonomic revision of the fungi producing the Chestnut disease known as 'ink'.]—*Bol. Pat. veg. Ent. agríc., Madr.*, 16, pp. 253–270, 9 figs., 1947. [Received December, 1949.]

The application of Leonian's key [*R.A.M.*, 14, p. 398] to cultures of the *Phytophthora* species responsible for ink disease of chestnut in Spain [ibid., 26, p. 364]

confirmed the supposition already entertained that *P. cambivora* is not the species commonly involved, the causal organism being identified as *P. cinnamomi* [see preceding and next abstracts]. It made good growth both at 27° C. and in the presence of malachite green (1 in 8,000,000). According to the same key, the isolates from *Erica* and *Castanea dentata* [loc. cit.] should also be referred to *P. cinnamomi*.

A comparison of a subculture of Rands's original isolate of *P. cinnamomi* and two isolates from Baarn (one each from *Rhododendron* and *Persea*) with other strains investigated, including two from chestnuts in Spain, revealed close agreement, except as regards resistance to malachite green, which was stronger in the last-named and those from *Erica* and *C. dentata* than in the remainder. Evidently *P. cinnamomi* and *P. cambivora* have been isolated indiscriminately in Europe, and some of the strains Petri isolated and Dufrénoy's isolate were certainly the former. Petri's original isolation and Leonian's [from *Juglans*] are undoubtedly true *P. cambivora*. The author's third group [loc. cit.] is also referred to *P. cinnamomi*.

Urquijo Landaluze (P.). **Acción de las sales de cobre sobre el hongo Phytophthora cinnamomi y difusión de aquellas en la tierra.** [Action of copper salts on the fungus *Phytophthora cinnamomi* and their diffusion in the soil.]—*Bol. Pat. veg. Ent. agríc., Madr.*, 16, pp. 295–310, 6 figs., 2 graphs, 1949.

A tabulated account is given of further laboratory experiments at Coruña, Spain, to determine the relative toxicity of several copper salts to various isolates of *Phytophthora cambivora*, *P. cinnamomi*, and *P. citrophthora*. The superiority of copper oxide over copper carbonate in the control of the pathogens has already been demonstrated [*R.A.M.*, 27, p. 165]. In these tests the former compound was surpassed in toxicity by copper aceto-arsenite, which at a dilution of 1:2,200,000 killed the mycelium of *P. cinnamomi* at a distance of 10 cm. in soil. Suspension of the salt in soil filtrates also exerted a more prolonged action than the other salts on *P. cinnamomi*, the most destructive and widespread of the different strains involved [see preceding abstracts].

Toole (E. R.). **White Pine blight in the southeast.**—*J. For.*, 47, 5, pp. 378–382, 1 fig., 1949.

This is a discussion of the existing position of white pine (*Pinus strobus*) blight in the south-eastern United States [*R.A.M.*, 28, p. 259] under the headings of symptoms, distribution and spread, damage, and possible causes. The disease has increased rapidly of recent years, especially in Virginia, North Carolina, and Georgia, and appreciable mortality may accompany the reduced growth rate and needle die-back. Inoculation experiments with the needle pathogens *Septoria spadicea*, *Hendersonia foliicola*, and *Lophodermopsis* sp. gave negative results, and their implication in the etiology of the blight is considered unlikely. Further work is necessary to determine the significance, in relation to blight, of root fungi and aphids, the latter either as a primary cause or as vectors of a virus.

Mowszowicz (J.). **Przyczynek do poznania fitocenoz mikologicznych, biorących udział w rozkładzie drewna i ściółki leśnej.** [A contribution to the knowledge of the mycological flora associated with the destruction of wood and forest litter.—*Acta Soc. Bot. Polon.*, 19, 2, pp. 195–199, 1948. [French summary. Received December, 1949.]

During 1945-47, the author collected various well-known timber Hymenomycetes in a forest near Lodź, Poland, the hosts including birch (*Betula verrucosa*), aspen (*Populus tremula*), oak, beech, pine, and spruce.

Orsenigo (M.). **Inchiesta sulla diffusione del 'cancro Americano' del Castagno (Endothia parasitica (Murr.) And.) nell' Italia settentrionale.** [Inquiry into the spread of 'American canker' of the Chestnut (*Endothia parasitica* (Murr.) And. in northern Italy.] *Notiz. Malatt. Piante, 1949*, 2, pp. 41–42, 1 map, 1949. [Mimeographed.]

In February, 1949, a survey was made of the prevalence of chestnut blight (*Endothia parasitica*) [*R.A.M.*, 29, pp. 129, 182] in northern Italy, and it was found that certain bark symptoms which had been attributed to this disease were due to infestation by *Gracilaria simploniella*. This insect is not a vector of the fungus, but the extensive damage it causes greatly facilitates infection. The localities where blight has been definitely diagnosed are in the provinces of Aosta, Torino, Cuneo, Novara, Varese, Como, Brescia, and Treviso.

Steyaert (R. L.). **Le problème des pourridiés dans les cultures arbustives tropicales et sa portée sur les techniques d'ouvertures des plantations.** [The root rot problem in the tropical culture of woody plants and its bearing on methods of opening up plantations.] –*Bull. agric. Congo belge*, 40, 2, 1 fig., pp. 1651–1678, [? 1948. Received November, 1949.]

In this paper (presented before the Conférence Africaine des Sols, Goma, Belgian Congo, 8th to 16th November, 1948), the author, after referring to the importance of root rots, [*R.A.M.*, 29, p. 170] especially in tropical areas, lists the fungi involved, and discusses in detail the biology and epiphytology of this group of diseases. He considers that inhibition of rhizomorph growth is due to the excretion of fungistatic substances by the living roots. In an area undisturbed by winds and containing a thick growth of trees spore dispersal is greatly reduced. Cutting down, whether followed or not by burning, not only suddenly upsets the biological equilibrium, but deposits on the soil an enormous amount of woody matter still full of sap, and at the same time kills a vast number of roots in the subsoil. An abundant fungal flora develops on this woody material.

It would seem that when a forest is cut down the foci of *Rigidoporus microporus* [?*Fomes lignosus*: cf. ibid., 17, p. 484] and other root rot fungi become freed from antagonistic influences and fungistatic materials produced by phanerogams and soil microbes. Mycelia and rhizomorphs develop vigorously on stumps containing abundant reserve starch [ibid., 16, p. 564]. The disappearance of the forest cover causes a rise in temperature and, as a result, the fungus develops rapidly and spreads. This is followed by infection of the more resistant stumps. The initial foci of infection are lost in a generalized infection which dies out only when the dead woody material has finally disappeared, a process which may take over 20 years. The author's observations also show that *Ganoderma* spp. and *F. noxius* may quickly appear on stumps, while in *Hevea* rubber and oil palm [*Elaeis guineensis*] plantations *Armillaria mellea* is a further menace.

It is concluded that the importance of root rots is a function of the quantity of dead wood in the soil. The great outbreaks of root rot that follow tree-felling might be prevented by removing as many stumps as possible or retarding planting until, in the course of years, all the woody material in the soil has completely disintegrated. The aim should be to prevent the development of latent foci of root rot and neutralize all material that can serve as a substratum for the causal organisms. It is suggested this may be done by passing gradually from forest to plantation. Clearing by large-scale felling should be abandoned. The forest layers are removed progressively until the undergrowth is reached. After planting, the undergrowth is then progressively cut down until a canopy of new growth is obtained. The neutralization of ligneous material can probably be effected by poisoning the trees with sodium arsenite or compounds of 2–4 dichlorophenoxyacetic acid before felling.

Wakefield (W. E.) & Kennedy (D. E.). **Cat-faces and their effect on the strength of telephone poles.** —*Mimeogr. For. Prod. Lab. Can.* 0–132, 4 [+3] pp., 3 pl., 1 fig., 1949. [Mimeographed.]

Scars under the bark on the wood surface of poles are known in Canada, because of their shape, as cat-faces, though they often appear as long, narrow furrows. They are frequently caused by a blow dealt to a living tree or, possibly, by some physiological factor. New wood is laid down in the area surrounding the exposed cambial tissue, but the effects of the injury are not completely eradicated. The wood forming over the wound may be accompanied by the deposition of considerable resin, or separated from it with sometimes inclusion of bark. The wood surrounding a cat-face may be less strong than normal wood. No cat-faces should be present, therefore, in those parts of a pole which have to bear maximum stress.

Hepting (G. H.), Roth (E. R.), & Sleeth (B.). **Discolorations and decay from increment borings.**—*J. For.*, 47, 5, pp. 366–370, 1 fig., 1949.

New data on the discolorations and decay resulting from increment borings made in 1937 in hardwoods and pines are reported from Pennsylvania and the southern Appalachians and compared with those already cited from the Lake States and the north-east [*R.A.M.*, 23, p. 370]. Most of the diffuse-porous species developed *Nectria* cankers at the borer holes, and in four species, viz., *Liriodendron tulipifera*, *Acer rubrum*, sweet birch (*Betula lenta*), and yellow birch (*B. lutea*), the wounds (50 per cent. in the last-named) were still open after ten years. The very dark discoloration extending from the holes in *A. rubrum* is commonly known as 'black heart', while a brown discoloration of *A. saccorophorum* [*A. saccharum*] covered a distance of 1 to 2 linear ft. The reddish-brown discoloration of birches often extended 7 ft. or more up and down the trunk, and decay, involving an average of 1 linear ft., was observed in about 20 per cent. of these species. The ring-porous scarlet and white oaks (*Quercus coccinea* and *Q. alba*) and three species of pine developed little die-back and healed fairly rapidly.

Since the defects consequent on increment boring extend uniformly upwards and downwards from the holes, the latter should be made as near the ground as practicable to minimize surface defects and discolorations and decay.

Villey (M.). **Rôle de la masse d'ensemencement sur les cultures de Coriolus versicolor (L.) Quél.** [Part played by the seeding mass in cultures of *Coriolus versicolor* (L.) Quél.] —*C.R. Acad. Agric. Fr.*, 36 [? 35], 17, pp. 698–700, 1949.

Experiments were carried out to determine how variations in the amount of mycelial inoculum of *Coriolus* [*Polystictus*] *versicolor* affected its subsequent development in liquid cultures or on beech blocks. The results indicated that if culture development was affected by slight differences in the mycelial masses employed, only the greatest divergences were capable of exerting a significant effect on individual variations in the results with timber.

Gould (C. J.) & Reynolds (C. E.). **Treating Douglas-Fir seed with spergon before stratification.**—*J. For.*, 47, 12, p. 984, 1949.

Douglas fir [*Pseudotsuga taxifolia*] seed, when collected during wet weather for stratification purposes on the western coast of the United States, often develops moulds, mostly *Fusarium* sp. [*R.A.M.*, 26, p. 517]. In 1944 and 1945, the seed was treated with spergon, the excess screened off, and the seed stratified with twice the volume of non-sterilized sand without stirring. The treatment was repeated before sowing in the greenhouse and field. Several mouldy clumps of seed and sand developed in all the untreated lots but none in the treated, though an occasional seed became mouldy. Germination tests with sample lots showed that the treatment increased slightly the percentage germination of the non-mouldy seeds. The

treated seed was much easier to handle and to separate from the sand than the untreated. Treatment before and after stratification generally gave better results than a pre-stratification treatment only. Treatment of Sitka spruce [*Picea sitchensis*] seed in similar, small-scale tests also gave good results.

HEBB (E. A.). **A study of the influence of overstory on the incidence of Cronartium cankers on Loblolly Pine.** [Abstract of Thesis, Louisiana State University, 1948.]—*J. For.*, 47, 5, p. 415, 1949.

As some field workers consider that damage caused by fusiform rust (*Cronartium* [*fusiforme*]) [*R.A.M.*, 28, p. 604] to southern pine [*Pinus* spp.] is greater in stands of trees of equal age than in those of different ages, a study was made to ascertain whether reproduction under an overstory showed more or less infection than reproduction not so influenced. Infection percentages for loblolly pine [*P. taeda*] reproduction were recorded on 38 paired plots in St. Helena Parish, Louisiana, one member of each pair being under an overstory. The results showed that overstory had no effect on the incidence of the disease.

GOGGANS (J. F.). **Cronartium fusiforme on Slash and Loblolly Pine in the Piedmont region of Alabama.**—*J. For.*, 47, 12, pp. 978–980, 1 fig., 1949.

A statistical analysis of the incidence of *Cronartium fusiforme* [see preceding abstract] in pine plantations in the Piedmont region of Alabama showed that in pure plantations there was no significant difference in the types of infection on slash pine [*Pinus caribaea*] or on loblolly pine [*P. taeda*] or between loblolly pine in pure and mixed plantations. Incidence on slash pine in mixed plantations was low, and there was therefore a highly significant difference in infection in mixed and pure plantations. Total infection (slash and loblolly together) in the mixed plantations was lower than that in either of the pure plantations.

Age was the only variable significantly correlated with *C. fusiforme*. All types of infection on slash pine in pure plantations decreased with age. Branch infection and stem and branch infection on loblolly pine in pure and mixed plantations decreased with age, while stem infection increased.

A new method of control is suggested by the slower growth and reduced infection of slash pine when grown in alternate rows with loblolly pine. It may prove desirable to plant stands with alternating rows or some other type of mixture and, at the proper time, thin out part or all of the loblolly pine.

LAW (KATHLEEN). **Phenol oxidases in some wood-rotting fungi.**—*Ann. Bot., Lond.*, N.S., 14, 53, pp. 69–78, 1950.

Experiments carried out at the University of Melbourne indicated that the decolorization of dyes by white wood-rotting fungi (*Polystictus versicolor*, *Ganoderma applanatum*, *Fomes robustus*, *F. rudis*, *Stereum hirsutum*, *Poria* sp., and *Polyporus gilvus*) is attributable to a specific phenol oxidase; brown rots (*P. anthracophilus*, *P. eucalyptorum*, *Coniophora cerebella* [*C. puteana*], and *Trametes lilacino-gilva*) cause no decolorization, and do not contain this enzyme in significant amounts [*R.A.M.*, 27, p. 342]. The action of the phenol oxidase of white rots somewhat resembles that of laccase, though the substratum specificity differs. Some brown rots contain a phenol oxidase which, from its reactions, resembles tyrosinase of mushroom and potato; other brown rots showed a negligible phenol oxidase reaction.

EDWARDS (W. A.). **The practical evaluation of wood preservatives.**—*Paint Technol.*, 14, 164, pp. 351–353, 1 fig., 1949.

Directions are given for the application of the wood-block method of testing to the practical evaluation of wood preservatives [*R.A.M.*, 18, p. 829 *et passim*].

Smith (Virginia M.). **On the mechanism of enzyme action. XXXIX. A comparative study of the metabolism of carbohydrates, in the presence of inorganic and organic phosphates, by Merulius lacrymans and Marasmius chordalis.**—*Arch. Biochem., N.Y.*, 23, 3, pp. 446–472, 9 graphs, 1949.

Comparative studies are reported of the growth of *Merulius lacrymans* and *Marasmius chordalis* [*R.A.M.*, 28, p. 554] on cellulose, glucose, cellobiose, α- and β-methylglucosides, xylose, and ethyl alcohol. *Merulius lacrymans* causes intense physical destruction of filter paper cellulose; hydrolyses cellobiose and β-methylglucoside before further utilization, α-methylglucoside being apparently utilized without preliminary hydrolysis; the accumulation of intermediates and growth rate on cellobiose are about equivalent to those on glucose, indicating that the metabolism is actually that of glucose; in metabolism of cellulose, cellobiose, and glucose, oxalate is the main isolable end-product; growth on ethyl alcohol medium is poor. From the growth rates on inorganic and organic phosphates, the latter being regarded as phosphorus donors, it is concluded that *M. lacrymans* degrades cellobiose through a preliminary phosphorolysis to glucose, thereby forming a phosphorylated glucose which is utilized more rapidly than added glucose; it does not utilize the phosphorylation route during the degradation of supplied glucose; ethyl alcohol is not degraded by way of the adenylic route.

Protection with chemicals : how it is done at Gaylord Container Corp.—*Pulp & Pap.*, 23, 11, pp. 78, 80, 1949. [Abs. in *Bull. Inst. Pap. Chem.*, 20, 3, p. 210, 1949.]

The results of nine years' spraying tests on southern pine pulpwood have shown that the application to the ends of the wood of a dowicide S [*R.A.M.*, 22, p. 413] mixture in the late spring and summer will prevent the development of sap stain or mould during a storage period of four months, as compared with three for untreated; in the autumn and winter the sprayed stock can be held for five or six months as against four for the unprotected material. About 100 truck loads can be treated daily for a fortnight with a mixture of 50 lb. dowicide S in 250 gals. water, sprayed through a small-diameter pipe 5 ft. long, branching into three ½-in. spray nozzles.

Smith (H. C.). **Light-leaf-spot of Brassicas.**—*N.Z. J. Sci. Tech.*, A, 30, 2, pp. 83–88, 4 figs., 1948. [Received December, 1949.]

Light leaf spot (*Gloeosporium concentricum*) [*R.A.M.*, 15, p. 474; 23, p. 475; 25, p. 329] is widely distributed on cauliflowers, with incidence ranging from 0 to 100 per cent., in all market-gardening districts near Auckland, cabbage plants being attacked occasionally. In most crops where the disease was present every plant was infected, but wide differences were noted in the amount of leaf area attacked. In no instance did the disease appear to be of great economic importance; in one crop with 50 per cent. infection the number of cauliflowers rejected because of infection was estimated at not more than 2 per cent. of the total crop.

The disease occurs at all times of the year, but seems to develop most readily in cool, rainy conditions and on slow-growing plants. The chief symptoms in the field are leaf distortion and a white film of spores. Lesions varying from ½ in. to 3 in. or more in diameter occur independently on both leaf surfaces and on the stems. A later symptom of severe infection is silvering of the leaf surface, caused by lifting of the cuticle.

The optimum temperature for growth in culture was 20° C. Spores from cauliflower leaves measure 6·5 to 14 by 2 to 3 (average 10 by 2·4) μ; they germinate with a single polar germ-tube.

Phenomenal Early cauliflower seedlings planted in the field and cold frame and inoculated at fortnightly intervals with spores from diseased leaves and from culture all became infected in 20 days. In a varietal resistance test on plants grown

in pots and in the field every early variety of cauliflower tested was highly susceptible (over half the leaves infected), while the late-maturing broccoli varieties Late Queen, Penzance, Roscoff No. 1, Roscoff No. 4, Satisfactory, St. George, and Snows Winter White, and Enfield Market cabbage were immune.

De Carvalho (K.). **A doença do enegrecimento das nervuras (podridão bacteriana) das Couves, Nabos, etc. (Xanthomonas campestris Dows.).** [The vein-blackening (bacterial rot) disease of Cabbages, Turnips, etc. (*Xanthomonas campestris* [Pamm.] Dows.).]—*Gaz. Agric., Moçambique*, 1, 4, pp. 79–82, 2 figs., 1949.

Black rot of cabbage, cauliflower, turnip, mustard, and other crucifers (*Xanthomonas campestris*) occurs in epiphytotic form in various regions of Mozambique. Information is presented on the symptomatology, modes of transmission, importance, and control of the disease under local conditions. Full directions are given for seed treatment with mercuric chloride [*R.A.M.*, 4, p. 459; 16, p. 721] and hot water, both of which procedures should be followed by dusting with spergon. Seed-bed soil should be sterilized by heat, and cultural measures should include a four- to five-year crop rotation.

Hull (R.). **Sugar Beet diseases. Their recognition and control.**—*Bull. Minist. Agric., Lond.* 142, iii+53 pp., 20 pl. (8 col.), 2 diags., 1949. 3*s.* net.

In this bulletin, designed primarily to be of use to growers and those handling the crop, full notes, based partly on the literature of the subject but to a great extent on investigational work at the Rothamsted Field Station, Hackthorn, Lincoln, are given on the symptoms and control of sugar beet diseases. The seedling diseases occurring in Great Britain comprise black leg (caused in England mainly by *Pythium ultimum*, *P. intermedium*, *Phoma betae* and to a lesser extent *Corticium solani*) [*R.A.M.*, 18, p. 646; cf. 27, p. 4], acid soil injury (associated with *Fusarium culmorum*, *F. angustum*, and other fungi) [cf. ibid., 18, p. 646], the most important seedling trouble of sugar beet in Great Britain, wind and frost injury, and strangles [loc. cit.].

In the part dealing with leaf diseases (pp. 6–37) a key is given for the identification of different kinds of yellowing [ibid., 25, p. 532] followed by sections on the virus diseases yellows [ibid., 29, p. 71], mosaic [ibid., 28, p. 431], dwarf (believed to be due to cucumber mosaic virus) [ibid., 28, p. 265], which has affected fields only slightly but severe infections have occurred in experimental steckling beds, and several diseases not yet reported in this country. Nutritional disorders are treated fully, most of which have been noticed in this *Review* [ibid., 25, pp. 532, *et passim*]. Fungus leaf diseases include downy mildew (*Peronospora schachtii*) [ibid., 27, p. 224]; powdery mildew, the identity of which remains uncertain, the causal organism being named *Erysiphe polygoni* in Russia and America [ibid., 23, p. 465], *Microsphaera betae* in Europe [ibid., 19, p. 187], while in England, where the disease occurs most freely in the east and south, the perfect state, seen only once, appears to be a species of *Erysiphe* [cf. ibid., 14, p. 548]; rust (*Uromyces betae*) [ibid., 7, p. 759]; leaf spot (*Cercospora beticola*) [cf. ibid., 7, p. 132], severe attacks of which occur only in the south and south west; *Ramularia* leaf spot (*R. beticola*), which occurs occasionally; *Phoma* leaf spot (*P. betae*) [ibid., 19, p. 186], and secondary leaf infections by various fungi, including *Alternaria tenuis*, *Sporodesmium putrefaciens*, and *Pleospora herbarum*.

Vascular diseases caused by soil-inhabiting fungi have received little attention in this country and the only one known to occur is 'black wood vessel' of the roots and is attributed to *Pythium* sp. Weather and insect injuries, and general abnormalities are also described. The part dealing with root diseases treats of violet root rot [*Helicobasidium purpureum*: ibid., 26, p. 475], white root rot (*Rosellinia necatrix*) stated to be a rare disease, wet rot (*Phytophthora megasperma*) [ibid., 18,

p. 646], scab caused by various *Actinomyces* spp. including, on mangolds, *A. tumuli* [ibid., 7, p. 137] and *A. scabies* [cf. ibid., 2, p. 466; 16, p. 510; 25, p. 544], girth scab (*A. albus* var. *cretaceus*, *A. intermedius*, and *A. nigrificans*) [ibid., 1, p. 183], which is of no economic importance in England, scurfy root (associated with acid soil and *F. culmorum*, *F. angustum*, and other fungi), crown gall (*Bacterium tumefaciens*) [ibid., 25, p. 545], crown and stem rots (*Phoma betae*) [ibid., 19, p. 186; 25, p. 54], *Fusarium* rot (*F. culmorum*) [ibid., 20, p. 332], clamp rot due to *Botrytis cinerea* [ibid., 24, p. 85; 25, p. 217], the most common type of rot on clamped beets in Britain, internal fleck detected only in cut roots, the cause of which is obscure, [undetermined] bacterial soft rot, black tail found occasionally, frost injury, lenticel rot, internal zoned rot, and eelworm canker (*Anguillulina dipsaci*) and various rots present in North America.

Limasset (P.), Grente (J.), & Bonnemaison (L.). **Essais préliminaires relatifs à la lutte contre la jaunisse de la Betterave.** [Preliminary experiments on the control of Beet yellows.]—*C.R. Acad. Agric. Fr.*, 36[?35], 17, pp. 679–681, 1949.

Preliminary experiments were carried out in Pevelle during 1949, in an effort to reduce the amount of beet yellows virus infection [*R.A.M.*, 27, p. 106; 28, p. 104]. Isolated beds of stecklings sown in the open were screened by five rows of hemp or three of maize, surrounding the plots of sugar beet 20 by 5 m. The whole was surrounded by two rows of seed beets serving as foci of infection. Late attacks of yellows became evident between August 6th and September 30th. The hemp protected against the first attacks but had little effect on the later ones, giving a final infection percentage of 36. With maize the converse was true (34 per cent.). The lower percentage in the plots surrounded by maize is explained by the disappearance of some of the leaves from affected plants. The unprotected plots had 78 per cent. infection.

The best control of yellows was obtained when aphicidal treatments were combined with the use of a screening crop of hemp, the percentage disease on August 6th and 30th September being 2·45 and 32 in the plots treated with nicotine sulphate at 250 c.c. per hl. plus a wetter, compared with 35 and 60 per cent. with spraying without hemp, and 46 and 78 per cent. without either. With an aphicide consisting of 4 per cent. diethyl thiophosphate and paranitrophenol at 0·25 per cent. the results were 2·75 and 31 with a hemp screen and 45·5 and 74 per cent. without one.

Hagedorn (D. J.) & Walker (J. C.). **Wisconsin Pea streak.**—*Phytopathology*, 39, 10, pp. 837–847, 3 figs., 1949.

The most conspicuous field symptoms of Wisconsin pea streak, which was found by Walker and Hare in about 60 per cent. of the 654 fields surveyed in the State in 1942 (*Res. Bull. Wis. agric. Exp. Sta.* 145, 1943) are a light brown to purple, necrotic streaking of the stems (which are often girdled) and petioles and browning of the nodes. Streaks are also frequently present on the peduncle, and the dorsal suture of the pod sometimes shows a brownish discoloration. Light brown, slightly sunken, necrotic areas occur on the leaves and pods, giving them a roughened appearance. In the case of early infection, such pods as develop do not fill normally. Terminal plant parts are slightly malformed in consequence of internodal shortening and apical leaf wrinkling and curling. Moderate axillary bud growth is common and some plants die prematurely.

In the greenhouse the disease assumes a milder form, characterized by progressive wilting. The first noticeable symptom on the infected plants was a steel-grey discoloration of the stem. In some cases the uppermost leaves and stipules had become chlorotic 11 to 14 days after inoculation, by which time small, brown, necrotic streaks were sometimes perceptible in the leaf and stipule veins and on the

stems. Nodal browning was conspicuous and the entire stem greyish-tan. After 14 or 15 days many plants were dead, and on others the stem streaks were up to several centimetres in length, even extending from one internode to another. Stunting was occasionally apparent and the apical growth sometimes curled over shortly before complete wilting and death. Besides peas, the following Leguminosae were artificially infected by the Wisconsin pea streak virus: soy-bean, which developed very slight general chlorosis, alsike clover (faint mosaic), red clover (mottle), Ladino white clover (very slight leaf wrinkle), *Vicia grandiflora*, *V. monantha* (stem streak in both species), *Melilotus alba* and *M. officinalis* (mottle), *Lathyrus hirsutus*, sweet pea, *Medicago orbicularis*, crimson clover, *Trigonella foenum-graecum*, *V. atropurpurea*, and *V. villosa* (all latent). Among the 18 pea varieties successfully infected, Delwiche Commando, Horal, Loyalty, Merit, Pride, Profusion, Wasatch, and Wisconsin Perfection showed more stem-streaking and less wilting than the others.

The virus proved extremely tolerant of dilution, being infective at 1 in 1,000,000. It withstood ageing for periods between 16 and 32 days. The thermal inactivation point for a ten-minute exposure was found to lie between 58° and 60° C. In one test 40 days of freezing failed to destroy the virus, but in two other trials it succumbed after 10 and 20 days, respectively. The disease was not transmitted by the pea aphid (*Illinoia* [*Macrosiphum*] *pisi*), nor was any evidence forthcoming of its perpetuation through the seed.

Reasons are adduced from these experimental data for the differentiation of the Wisconsin pea streak virus from pea streak virus [*R.A.M.*, 17, p. 721 ; 26, p. 1], New Zealand pea streak virus (*Pisum* virus 3) [pea streak virus: ibid., 18, p. 648], and Johnson's pea wilt virus [ibid., 21, p. 293].

JØRSTAD (I.). **Erterust, Uromyces pisi (DC.) Fuck., i Norge.** [Pea rust, *Uromyces pisi* (DC.) Fuck., in Norway.]—*Nord. JordbrForskn.*, *1948*, 7–8, pp. 198–207, 1948. [English summary.]

Between 1944 and 1946 *Uromyces pisi* was collected in the uredo and teleuto stages on garden peas in six localities along a 250 km. stretch of the south-eastern coast of Norway, infection in some cases being severe. The rust being heteroecious, its appearance must have been due either to the presence of its aecidial stage on *Euphorbia cyparissias* [*R.A.M.*, 19, p. 637] and related species or to wind-borne spores from extraneous sources, the latter hypothesis being considered unlikely. In June, 1948, aecidia were, in fact, collected on wild *E. cyparissias* at a distance of about 25 km. from the nearest site known to harbour *U. pisi*. On garden peas inoculated with these aecidia under controlled conditions the uredo stage of the rust developed, denoting that the former belongs to the race of the rust restricted to peas [ibid., 2, p. 341]. Another potential host of *U. pisi* is *E. esula* [ibid., 3, p. 486], which also occurs in the same region but, unlike *E. cyparissias*, is not cultivated as an ornamental.

The race of *U. pisi* attacking *Lathyrus pratensis* [loc. cit.] has been collected only four times in Norway, also along the south-eastern coast, once in 1933 and on three occasions in 1948. It is facultatively heteroecious, as also is *U. loti* (*U. euphorbiae-corniculatae*) [ibid., 25, p. 454] on *Lotus corniculatus* (reduced by Arthur [ibid., 13, p. 728] to varietal rank as *U. striatus* var. *loti* (Blytt) Arth.), which is fairly common in the uredo stage in coastal areas as far north as Trøndelag.

The various leguminicolous forms of *Uromyces* using *E. cyparissias*, *E. esula*, and *E. virgata* as their alternate hosts may be regarded as races of the collective species *U. pisi* sensu lato, which comprises a variety of intermediate types between those with punctate-verrucose teleutospores, such as *U. pisi* sensu stricto, and the punctate-striate forms, e.g., *U. striatus* [ibid., 18, p. 397]. The heteroecious species now commonly accepted are largely attached to particular host genera, for example,

U. cytisi (*U. genistae-tinctoriae*) on *Caragana* [ibid., 27, p. 387], *Cytisus* [ibid., 27. p. 462], *Genista*, etc., *U. fischeri-eduardi* on *Vicia cracca* [ibid., 15, p. 607], and *U. punctatus* (*U. astragali*) on *Astragalus* and *Oxytropis*. *U. fabae* (*U. viciae-fabae*) [ibid., 5, p. 511 *et passim*] has been found four times on garden peas in Norway, the last collection dating from 1947.

Aberdeen (J. E. C.). **Report on nestiness in Beans.**—*Banana Bull., Sydney*, 12, 138, p. 20, 1949.

Green beans [*Phaseolus vulgaris*] reaching the Melbourne and Sydney markets during the period from May to August are frequently affected by a condition known as 'nestiness', from the binding together of clumps of beans near the middle of the packed bundles by a white or a black mould. The examination of 14 samples of 'nests' between 18th June and 18th August, 1948, revealed the implication of white mould (*Sclerotinia sclerotiorum*) [*R.A.M.*, 28, p. 435] in six and of black mould (*Rhizopus* sp.) in seven, together with miscellaneous bacteria in several specimens. Some of the samples harboured both fungi. Severe attacks of *S. sclerotiorum* were limited to areas where the intensity of sunlight was considerably reduced, either through direct shading or by growing the winter crop on southern slopes. Black mould was not observed in an active form in the field. Control measures, based on experiments performed in the United States, are indicated.

Middleton (J. T.), Stone (M. W.), & Kendrick (J. B.). **Incidence of Lima Bean root rot in soils treated with fumigants and insecticides for control of wireworms.** —*Phytopathology*, 39, 10, pp. 813–821, 1949.

It appeared from the results of a survey covering several years in Ventura County, California, that Lima bean (*Phaseolus lunatus*) root rot (*Fusarium solani* f. *phaseoli*, *Pythium ultimum*, *Rhizoctonia* [*Corticium*] *solani*, and *Thielaviopsis basicola*) [cf. *R.A.M.*, 26, p. 476] tends to be more prevalent in light than in heavy soils. The fact that the former are usually rich in nematodes (*Heterodera marioni*) and sugar beet wireworms (*Limonius californicus*) suggested that root infestation by these organisms paves the way for root rot. In 1946–7 two soil fumigants, DD (dichloropropene-dichloropropane) [ibid., 27, p. 23] and an ethylene dibromide solution [ibid., 29, p. 194], and two insecticides, benzene hexachloride and DDT, were tested against *L. californicus* in fine and very fine sandy loam soil. DD was applied at dosages of 18, 22, 26, and 36 gals. per acre, ethyl dibromide at 21 and 22 gals., benzene hexachloride at 4 lb., and DDT at 10 and 20 lb.

The injury index, i.e., the sum of the products of the value of each class from 0 to 4 (0, 25, 50, 75, and 100 per cent. injury) and the number of individuals within that class, divided by the total number of individuals in the sample (10 plants from each of the four plots collected about six weeks after sowing), was found to be directly related to the number of fungi present on the root system of diseased plants. It was reduced by all the treatments, especially DD [cf. ibid., 26, p. 231]. Thus, in one plot the injury index was reduced from 3·6 (63 isolates) in the control block to 2·2 and 1·8 (36 and 28) by DD at 26 and 36 gals. There was also a correlation, but less close, between the wireworm population and the root rot.

Wellhausen (E. J.), Roberts (L. M.), Muñoz (J. M.), & Linton (C.). **Frijol Rocamex 1, 2 y 3, tres variedades mejoradas para siembras de temporal en la Mesa Central.** [Rocamex Beans 1, 2, and 3, three improved varieties for rainy-season sowing in the Central Plateau.]—*Foll. Divulg. Secret. Agric. Méx.* 8, 19 pp., 6 figs., 1 map, 1949. [English summary.]

The bean (*Phaseolus vulgaris*) varieties Rocamex 1, 2, and 3, which appear to be well adapted for cultivation in the Central Plateau of Mexico during the rainy season commencing in early to mid-June, are resistant to the locally prevalent

rust [*Uromyces appendiculatus*], developing during the latter part of the season and apt to cause premature defoliation. They are also more resistant to [unspecified] root rots than Canario, but fairly susceptible (in common with all other varieties so far tested) to anthracnose [*Colletotrichum lindemuthianum*].

Adams (A. F. R.). **Copper deficiency of Onions grown on peat. I. Preliminary report.**—*N.Z.J. Sci. Tech.*, A, 30, 2, pp. 105–109, 2 figs., 1948. [Received December, 1949.]

In January, 1947, a crop of onions on acid peat soil (pH 4·5 to 5, with 70 per cent. organic matter) near Christchurch, New Zealand, contained many almost bare patches and others where the plants had declined after about eight weeks' growth. A month after spraying with 1 oz. copper sulphate in 2½ gals. water plus wetter per 15 sq. yds., applied directly to the plants, a marked improvement was shown, though other plants treated with different elements had deteriorated further [*R.A.M.*, 28, p. 378].

The copper deficiency symptoms observed consisted in paleness of the leaves with slight chlorotic mottling and loss of turgor (especially in the older leaves) from the tips downwards. The affected leaves later bent back, withered, and died back to the point of bending. The bulbs were poorly developed; most failed to mature, and some retrogressed and finally withered. The root system was very weak. Further work is in progress.

Smith (P. G.). **Downy mildew immunity in Spinach.**—Abs. in *Phytopathology*, 39, 10, p. 863, 1949.

About half the plants of one out of nine Bureau of Plant Exploration and Importation lots of spinach tested for resistance to downy mildew [*Peronospora effusa*: *R.A.M.*, 23, p. 423] were found to be immune. Tests on the F_1 and first back-cross populations of this lot (P.I. 140,467) in crosses with susceptible commercial varieties (of which there were 17 in these experiments) indicated control of immunity by a single dominant gene.

Knight (C. A.). **The apparent sulfur in Cucumber virus 4.**—*J. Amer. chem. Soc.*, 71, 9, pp. 3108–3110, 1949.

In experiments at the Virus Laboratory, Berkeley, California, a highly purified preparation of cucumber virus 4 [? a strain of cucumber green-mottle mosaic virus: *R.A.M.*, 14, p. 554; 29, p. 198], obtained from plants supplied with a nutrient solution containing a radio-active isotope of sulphur (S 35), was found to possess much less than 1 per cent. of the calculated radio-activity of a compound comprising 0·6 per cent. sulphur. It appears, therefore, that sulphur is absent from cucumber green-mottle mosaic virus, which is believed to be distantly related to that of tobacco mosaic [ibid., 29, p. 126]. In a similar preparation of the latter virus, which has been shown by Ross (*J. biol. Chem.*, 136, p. 119, 1940) to contain 0·2 per cent. sulphur, 55 per cent. of the calculated radio-activity was present. The nature of the pseudo-sulphur found in 90 per cent. of the analyses of cucumber green-mottle mosaic is still obscure, but it seems clearly to be an artefact. The absence of sulphur from this virus is remarkable in view of its presence, mainly in the form of cysteine, in all the strains of tobacco mosaic virus previously analysed.

Gahm (O. E.). **Mushroom growing in the United States.**—*Mushroom News* (W. Darlington & Sons, Ltd., Worthing, Sussex), 2, 5, pp. 68–78, 11 figs., 1 diag., 1950.

In this lecture to mushroom growers at Worthing in November, 1949, the author described the growth of the mushroom industry and mushroom research in the United States up to the present day. Methods of lowering production costs with special reference to mechanical turning and the two-zone tray system [*R.A.M.*,

28, p. 268], the advantages and methods of peak heating including the use of gilled tubes, the economic importance of vert-de-gris (*Myceliophthora lutea*) [ibid., 27, p. 215] and its prevention and control, and the various methods of soil treatment to control pests and diseases were discussed.

Cantaloup mosaic investigations in the Imperial Valley. 1949.—*Plant Dis. Reptr, Suppl.* 187, 12 pp., 1949. [Mimeographed.]

In further investigations into cantaloupe mosaic disease in the Imperial Valley, California [cf. *R.A.M.*, 28, p. 504], R. C. Dickson (p. 284) states that owing to the lower aphid population (52·5 per cent. of which was *Myzus persicae*, chiefly bred on sugar beet) the damage caused by the disease was greatly reduced in 1949, late infections being contracted by less than 40 per cent. of the plants. The aphids stop only briefly to feed upon cantaloupes during their migratory search for better hosts. No insecticides were found effective for a practical control.

J. T. Middleton (pp. 285-286) reports that inoculations of vegetable marrow, watermelon, and cowpea with juice extracts from various infected cucurbits, collected locally in May and June, permitted the separation of the viruses in them into three groups: cucumber virus 1 [mosaic virus] caused symptoms in all three hosts; an undescribed cucumber virus caused symptoms only in vegetable marrow; squash mosaic virus caused symptoms only in vegetable marrow and watermelon. All three viruses caused similar symptoms in cantaloupe. Squash mosaic virus was the most common virus in the area in 1949, present mainly in cantaloupe with the undescribed virus next. Commercial marrow plantings appear to be the main sources of the squash mosaic virus. It is present during winter and early spring months and can be introduced into marrow and cantaloupe plantings by means of viruliferous seed.

In tests conducted by G. W. Bohn and T. W. Whitaker (pp. 287–290), the mosaic reactions of 12 inbred lines of cantaloupes resistant to powdery mildew [*Erysiphe cichoracearum*: ibid., 28, p. 54] were compared with three commercial varieties. The results showed that eight of the inbred lines were markedly tolerant of mosaic, though commercially unsuitable. They may, however, become valuable parental stocks in the breeding programme. The commercial varieties were highly susceptible.

F. W. Zink and G. N. Davis (pp. 291–294) state that nitrogen fertilizers (applied as ammonium nitrate at various rates) had no effect on the severity of cantaloupe mosaic as reflected in yield and symptoms. In conclusion, the authors summarize the information obtained in these investigations.

Winkler (A. J.). **Pierce's disease investigations.**—*Hilgardia*, 19, 7, pp. 207–264, 9 graphs, 8 diags., 1949.

This paper is a special report covering the investigations by W. B. Hewitt, N. W. Frazier, J. H. Freitag, and the author into Pierce's disease (lucerne dwarf virus) of vines in California [*R.A.M.*, 28, p. 563 *et passim*]. All aspects of the disease including symptoms, cause, vectors, and control are dealt with. From 1943 to 1945 when summer grasses were not allowed to grow in the vineyards thus keeping down vector populations, the disease declined and there was more vine growth. Tables of the vector populations from 1943 to 1946 are also given. The host range of the virus includes 73 species of plants ranging from grasses to shrubs.

Rosella (E.). **Le court-noué s'étend : certains viticulteurs aident à sa propagation.** [Court-noué is spreading: certain vinegrowers are helping to spread it.] — *Vitic. Arboric., Paris*, 95, 12, p. 344, 1949.

The author has discovered recently that certain vine-growers in the south of France play an active part in spreading court-noué by allowing shoots from stocks

growing in infected vineyards to be sold to well-known nurserymen who have no scruples about establishing them in their nurseries. The stock *Rupestris monticola* may have become infected with court-noué in this way.

KAVANAU (J. L.). **On correlation of the phenomena associated with chromosomes, foreign proteins and viruses. I. Chromosome activity. II. Foreign protein-induced phenomena. III. Virus-associated phenomena.**—*Amer. Nat.*, 83, 809, pp. 95–107, 107–112; 810, pp. 113–138, 1949.

In the first part of this article the author discusses, with extensive and comprehensive references to the literature, the fundamental forms of chromosome activity, particularly in relation to nucleic acid. The second is devoted to phenomena induced by the presence of foreign proteins in the tissues of an organism, and the third to the characteristics and reproduction of both animal and plant viruses, the nature and formation of inclusion bodies, further aspects of viruses and virus infection, anti-viral immunity (with reference to the persistence of antibodies, the site of antibody synthesis, and plant immunity), and the pH factor. It is suggested that plant immunity is conferred by the persistence of the virus in relatively inactive aggregates. New virus gaining access to the plant is absorbed to these aggregates under the action of specific attractive forces and inactivated by the association.

RODRIGUEZ SARDIÑA (J.), MARTINEZ CORDON (F.), & RUBIO HUERTOS (M.). **Consideraciones acerca de las técnicas de tinción de inclusiones en las virosis vegetales.** [Considerations on the methods of staining plant virus inclusions.] —*Bol. Pat. veg. Ent. agríc., Madr.*, 16, pp. 311–320, 12 figs., 1949.

The authors tested a number of methods for the staining of virus inclusions [cf. *R.A.M.*, 28, p. 438], using material of White Burley tobacco inoculated with tobacco mosaic virus, tomato with *Nicotiana* viruses 1 and 1 A [strains of tobacco mosaic virus], and 40-day stock (*Matthiola incana*) [var. *annua*] with a crucifer virus causing severe foliar mosaic and distortion and floral breaking [ibid., 27, p. 114; 28, p. 262]. The fixatives used were Zenker's, Allen's, and 10 per cent. formalin. Very satisfactory coloration of both fresh and fixed specimens was obtained with phloxine or trypan blue [ibid., 26, p. 82], or a combination of both. For permanent preparations the best stains are Feulgen's or Altmann's, followed in both cases by three to six minutes in light green. If photomicrographs are required, Altmann's acid fuchsin alone should be used. The inclusions of the crucifer virus presented analogies with those of tobacco mosaic virus.

BAWDEN (F. C.). **Plant pathology department.**—*Rep. Rothamst. exp. Sta., Harpenden, 1948*, pp. 51–56, 1949.

Further work on virus diseases at Rothamsted [*R.A.M.*, 28, p. 618] showed that in electron micrographs the rod-shaped particles of potato virus X appear less rigid than those of tobacco mosaic; all methods of purification caused them to become entangled. The crystallizable nucleoprotein obtained from plants infected with the Rothamsted culture of tobacco necrosis virus [ibid., 28, p. 208] has particles only about 17 mμ in diameter [ibid., 27, p. 452], but infective particles may be larger, as they sediment more readily.

Serological tests showed tobacco veinal necrosis virus to be related to potato virus Y, but the two were not mutually antagonistic when present together in the same plant.

Evidence was obtained that water-culture solutions in which roots of virus-infected plants were growing could become infective. The addition of sap containing virus X, tobacco mosaic, or tomato bushy stunt virus to soil in which tomato plants were growing produced root infections by all three viruses. Passage into

the aerial parts occurred more frequently when the plants were cut back so that new side shoots developed. In fertilizer tests with sand cultures on the susceptibility of tobacco plants to tobacco mosaic virus [ibid., 28, p. 618] nitrogen, phosphorus, and potassium affected virus multiplication in the same way as with plants growing in soil, but increased nitrogen increased susceptibility more in sand than in soil.

The 1947 tests again demonstrated that to prevent the spread of leaf roll and rugose mosaic [ibid., 28, p. 304] roguing of Majestic potatoes should be carried out by the first week in July, or earlier with Arran Pilot, to give any significant control. *Myzus persicae*, the vector of sugar beet yellows virus [ibid., 28, p. 370; 29, p. 71], overwinters on plants out-wintered and grown on without transplanting. Better stands of seed plants were obtained from clamped stecklings than from out-wintered ones in Berwickshire. The number of infected plants was reduced and yield of seed increased by sowing stecklings in April in a cover crop of barley, as compared with July sowing in a nursery bed, and by delaying sowing until late August. In a field experiment at Woburn the number of sugar beet plants developing yellows and the size of the aphis infestation were approximately constant per unit area. Doubling the plant population approximately halved the percentage of infection.

Observations at Taplow showed that *M. persicae*, also a vector of lettuce mosaic [ibid., 28, pp. 110, 503], was a common pest of lettuce. Overwintering crops were most severely affected by mosaic, many being rendered worthless. Young crops became infected by aphids migrating from older crops, which may also serve as sources of the virus. Diseased plants arising from infected seed may cause 3 per cent. or more initial infection. In isolated crops infected seed is probably the chief source of outbreaks, but spread from neighbouring diseased crops can cause high incidence in crops initially virus-free.

Experiments on eyespot of wheat (*Cercosporella herpotrichoides*) [ibid., 29, p. 151] were complicated by a severe outbreak of take-all (*Ophiobolus graminis*) [ibid., 28, p. 281 and below, p. 253]. Spraying with sulphuric acid reduced the area lodged from 59 to 20 per cent., and increased straw and grain yield, but had no effect on take-all. The addition of 2 and 4 cwt. ammonium sulphate per acre reduced the area affected by take-all from 54 per cent. to 26 and 13 per cent., respectively. Nitrogen increased the proportion of the crop that became lodged and increased yield only on acid-sprayed plots which did not become lodged. Increasing the rate of seeding from 1·5 bush. per acre to 2·8 and 3·5 increased the area affected by take-all, which prevented any increased lodging. The plots which were unsprayed received no nitrogen, and had the highest seed rate were weedy, had much take-all, and gave a grain yield of only 11·7 cwt. per acre. A lower rate of seeding, combined with spraying and the addition of nitrogen, reduced weeds and take-all and increased yield to 29·1 cwt. per acre. Outdoor pot experiments showed that eyespot severity was greatly reduced by adding ammonium sulphate to ordinary field soil and soil rich in organic matter. Phosphate in the presence of lime increased eyespot and decreased yield. In sand cultures loss of yield due to eyespot was reduced by the addition of nitrogen, phosphorus, and potassium, nitrogen being most effective in reducing loss and phosphorus least so.

The survival of *Plasmodiophora brassicae* [ibid., 28, pp. 431, 554, 619; 29, p. 205] was studied under various crops and in fallow. Boxes of infested soil were sown with cabbage, kale, *Lepidium sativum*, *Matthiola incana*, *M. bicornis*, *Papaver rhoeas*, *Tropaeolum majus*, bean [*Phaseolus vulgaris*], and onion, and survival was tested after three months. The number of infected root hairs after cruciferous crops was lower than after non-crucifers (except *Papaver*). Survival in fallow soil appeared to be affected by the addition of fertilizers. Cabbages following on in all the boxes previously used developed 90 to 100 per cent. club root in spite of differences in root hair infection. Over 90 per cent. of the *L. sativum* plants became

affected. Neither species of *Matthiola* formed clubs, and no plasmodia or resting spores were seen in root sections, though the root hairs contained zoosporangia; this suggests a difference in pathogenicity between the root hair stage and that generally associated with clubbed roots [cf. loc. cit.]. Zoosporangia indistinguishable from those of *Plasmodiophora brassicae* were found in the roots of many non-cruciferous plants, and zoospores were discharged from the root hairs of *Papaver rhoeas*. Convincing evidence was obtained that *P. brassicae* can infect and form zoosporangia (but no other recognizable stages) in the root hairs of *Papaver rhoeas*, *T. majus*, *Reseda odorata*, *Lolium perenne*, *Agrostis alba stolonifera* [*A. stolonifera*], and *Dactylis glomerata*.

Plantesygdomme i Danmark 1947. Årsoversigt, samlet ved Statens plantepatologiske Forsøg. [Plant diseases in Denmark 1947. Annual survey of data collected by the State Phytopathological Experiment Station.]—*Tidsskr. Planteavl*, 53, 2, pp. 185–234, 2 graphs, 1950. [English summary.]

The following are among the many items of interest in the sections contributed to this report [cf. *R.A.M.*, 28, p. 158] by H. R. Hansen and Anna Weber. Swedes and cereals were seriously affected by copper deficiency [ibid., 21, p. 92; 27, p. 337] and the former responded by increased yields to applications of copper sulphate at the rate of 50 kg. per ha. Lucerne suffered from boron deficiency [ibid., 24, p. 406], which was remedied by soil amendments with borax at 15 kg. per ha., resulting in yield increases in two trials of 2,800 and 8,000 kg., respectively. Among other physiogenic diseases observed were water core [ibid., 25, p. 123] and magnesium deficiency of apples [ibid., 28, p. 4]. On light, dry soils in north Jutland the last-named disturbance occurred in the form of dry, brown spots on Cox's Orange leaves, while Graasten and Signe Tillisch developed marginal chlorosis.

Beet mosaic virus [ibid., 27, p. 410] appeared in seed-beds as early as May, while beet yellows virus [loc. cit.; 29, p. 132] was prevalent except in Lolland, Falster, the southern part of south Jutland, and west Jutland; infection by both viruses was mild. Another disease presumed to be of virus origin is 'flat limb' of apple trees, which chiefly affects the Graasten variety and appears to have spread from certain nurseries to a number of gardens and fruit farms. *Allium* mosaic (*Allium* virus 1) [onion yellow dwarf virus] was common in Zittauer plants grown from setts. In shallots [ibid., 29, p. 6] the disease was less prevalent than formerly, thanks to the selection programme.

Black leg of mangolds and beets (*Pythium*, *Phoma*, and other organisms) was unusually widespread and virulent. Club root of cabbage, swedes, and turnips (*Plasmodiophora brassicae*) was very common and in some localities, especially in Jutland, the outbreaks were severe. Potato wart disease (*Synchytrium endobioticum*) was reported from 17 new municipalities [ibid., 27, p. 580; 28, p. 158]. Potato scab (*Actinomyces scabies*) was very prevalent and assumed a serious form even on soils with a low pH (5·2 to 6). Celery sustained heavy damage from *Septoria apii*.

Elderberries were widely attacked by *Gloeosporium fructigena* var. *sambuci*, at one place so severely that the fruit was unsaleable. *Sphaerotheca mors-uvae* was destructive on gooseberries. *Cronartium ribicola* was widespread and destructive on black currants [ibid., 8, p. 753], especially in western Zealand. Raspberries were frequently attacked by *Didymella applanata* [ibid., 9, p. 117].

Nilsson (L.). **Några växtpatologiska företeelser i Skåne 1949.** [Some phytopathological observations in Scania 1949.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1949*, 6, pp. 1–3, 1949.

Heavy losses were caused in the province of Scania, Sweden, in 1949 by potato blight [*Phytophthora infestans*: *R.A.M.*, 28, p. 191], the first reports of which were received at midsummer. Early Puritan was attacked in a number of localities about

1st July, and soon afterwards symptoms were observed on Bintje and other second-early varieties. By the end of August many unsprayed crops had been almost or wholly destroyed. The protracted summer drought resulted in rape plants long remaining stationary at the heart-leaf stage and early in September they were decimated by *Peronospora brassicae* [*P. parasitica*].

Fruit diseases included blossom wilt and spur canker of apple (*Sclerotinia laxa* f. *mali*) and peach leaf curl (*Taphrina deformans*), the latter being particularly destructive.

Borg (Å.). **Några växtsjukdomar och skadegörare på lantbruksväxter i Västergötland 1949.** [Some plant diseases and pests of agricultural plants in West Gothland 1949.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1949*, 6, pp. 6–10, 2 figs., 1949.

In general the autumn-sown cereal crops overwintered well in West Gothland, Sweden, in 1948–9, and parasitic diseases were unimportant. There were, however, severe attacks of mildew (*Erysiphe graminis*) on summer wheat at the end of May and in June. Take-all and whiteheads (*Ophiobolus graminis*) occurred sporadically on wheat in a severe form. Cereal loose smuts (*Ustilago* spp.) and stripe disease of barley (*Helminthosporium gramineum*) were prevalent.

Both the spring and autumn rape crops were attacked by *Plasmodiophora brassicae*, while a species of *Alternaria* was responsible for black spot of the same host, colza, and white mustard.

The mild autumn and winter were conducive to clover rot (*Sclerotinia trifoliorum*) [*R.A.M.*, 28, p. 279 and next abstract], the incidence of which in some cases exceeded 90 per cent., while a number of pastures had to be ploughed up.

Potato blight [*Phytophthora infestans*: see preceding abstract] did not appear until fairly late (end of August to early September) and was not such an important source of storage rot as in some other parts of the country. *Corticium solani*, however, caused considerable discoloration of stored tubers. More serious from the harvest point of view was black leg (*Erwinia phytophthora*) which assumed a destructive form in a number of fields.

Swedes and turnips in light soils sustained heavy damage from boron deficiency. In severe cases the mottled internal tissues were entirely disintegrated by adventitious fungi and bacteria.

Wahlin (B.). **Några viktiga sjukdoms- och skadedjursangrepp på lantbruksväxter i Östergotland 1949.** [Some important outbreaks of diseases and pests on agricultural crops in East Gothland 1949.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1949*, 6, pp. 11–15, 1949.

Fungal parasites of linseed flax in East Gothland in 1949 included a widespread species of *Phoma*, *Alternaria linicola* [*R.A.M.*, 29, p. 213], another species of *Alternaria*, and an *Oidium*, the latter two not yet identified.

Clover rot (*Sclerotinia trifoliorum*) [see preceding abstract] was responsible for heavy losses in pastures. In the experimental field of the Linköping branch of the Plant Protection Institute half the red clover crop perished from this cause. *Epichloe typhina* was reported on fodder grasses [ibid., 14, p. 706 *et passim*] from various places.

Annual Administrative Report of the Department of Agriculture, United Provinces for the year 1947–48.—89 pp. 1949.

On p. 27 of this report [cf. *R.A.M.*, 28, p. 55] it is stated that tests of sugar-cane varieties for resistance to red rot [*Physalospora tucumanensis*: loc. cit.] showed that Co. S.311, Co. 312, Co. 552, and Co. 557 were highly susceptible. At Shahjahanpur

all six 'desi' varieties [ibid., 28, p. 5] tested proved resistant, and all varieties except Co. 557 were resistant to wilt [*Cephalosporium sacchari*: loc. cit.]. At Gorakhpur only Co. 557 and Co. 552 were susceptible to wilt. In zonal trials (pp. 31–32) Co. 513 was found generally resistant to diseases and pests and is being considered for release.

The results of tests showed that agrosan GN was most effective in controlling grain smut of sorghum [*Sphacelotheca sorghi*: ibid., 28, p. 55], while ceresan proved most satisfactory in combating smut of *Pennisetum typhoides* [*Tolyposporium penicillariae*: loc. cit.].

Satisfactory control of potato mosaic [? potato virus X] is obtained only if all fields are rogued. Potato plants at the Research Farm, Kanpur, suffered serious damage from a species of *Alternaria*, which differed from *A. solani* [ibid., 27, p. 89]; it caused irregular, brown spots on the leaves and stems. Further studies are in progress.

Linseed varieties were attacked by two types of wilt, one sudden and the other gradual, probably due to two strains of *Fusarium lini* [ibid., 28, p. 562]. The pathogen retained its viability for 14 months both in culture and in the field, indicating that it is carried over in infected root pieces in the soil.

Die-back and wilt of groundnut caused by a species of *Fusarium* was controlled at Almora and Bastia by improved drainage.

Wilt of gram [*Cicer arietinum*] in which a number of [unspecified] pathogenic fungi seem to be involved, is becoming serious in the United Provinces. Late varieties were very susceptible to rust (*Uromyces ciceris-arietini*) [ibid., 27, p. 110] which, owing to bad drainage, assumed epidemic proportions at the Government Farm, Nawabganj, Bareilly. It was confirmed (p. 41) that the variety of arhar [pigeon pea], 17W/2 [ibid., 28, p. 5], resistant to wilt [*F. udum*], possesses good commercial qualities and is being distributed. By growing pigeon pea with sorghum the incidence of *F. udum* in an artificially infested field was reduced from 79 per cent. to 44 per cent. The Kanpur strain No. 78/2–5/4 was most resistant, followed by NP 80. A different type of wilt occurred, in which the branches died one after another; a culturally different strain of *F. udum* was isolated.

Diseases of mango include powdery mildew (*Oidium* sp.) [*O. mangiferae*: ibid., 25, p. 292] and bunchy top virus, both recorded for the first time from Sikanderbagh, United Provinces. Fully grown guava trees suffered serious losses from a die-back and wilt, which was reported from 11 districts of United Provinces. A species of *Cephalosporium* was responsible. Good control was achieved with chaubattia paste (4 ozs. red lead, 4 ozs. copper carbonate, and 5 ozs. lanoline) applied to the cut surfaces after the removal of affected branches. Other new records include *Colletotrichum fici* and a species of *Cercospora* [ibid., 21, p. 350] on fig.

Gadd (C. H.). **Report of the Pathologist for the year 1948.**—*Bull. Tea Res. Inst. Ceylon* 30, pp. 27–38, 1949.

In this report [cf. *R.A.M.*, 28, p. 490] it is recorded that young tea shoots inoculated with a spore suspension of *Colletotrichum camelliae* [*Glomerella cingulata*: ibid., 28, p. 549] developed 42 brown blight infections on 20 leaves when wounded in 46 places, as against only 3 on 13 unwounded leaves. Similar inoculations on potted tea seedlings confirmed the conclusion that *G. cingulata* is not a virulent parasite, and that it gains entry only into wounded or injured leaves. After tipping in bright, sunny weather, the leaves hitherto shaded often develop sun scorched areas, which later become invaded by fungi, mainly *G. cingulata* and *Pestalotia palmarum* [ibid., 28, p. 489].

Blister blight (*Exobasidium vexans*) [ibid., 28, pp. 490, 548] was most severe in the mist zone of the Dimbula district. The cells invaded by the fungus are not killed until the fungus has completed its life-cycle and produced a vast number of

spores: at this stage the white blisters turn black. Inoculation experiments showed that when premature blackening, caused by *G. cingulata* [ibid., 28, p. 549], takes place the cells invaded by the fungus are quickly killed, infection extending beyond the blighted areas in severed leaves but not in attached ones. The death of the leaf cells caused the immediate death of *E. vexans*. The premature destruction of the primary parasite markedly reduced the number of available spores, and to this extent secondary invasion by *G. cingulata* or other fungi causing similar damage is beneficial, though unlikely to reduce blister blight to the status of a minor pest.

A new symptom of phloem necrosis [ibid., 28, p. 508] was noted on many bushes in the Kandapola area. The expanded leaves rotated so that the lower surface faced upwards. In some, part of the blade died, probably as a direct result of the virus attack.

An unusual disease of tea seedlings, reported from a low-country estate, was caused by *Sclerotium zeylanicum* [? *S. rolfsii*: ibid., 12, p. 248], which is common in this area, but seldom attacks tea seedlings. *Albizzia* seedlings were affected by *Ceratophorum albizziae* [ibid., 20, p. 599].

PARHAM (B. E. V.). **Annual Report of the Economic Botanist for the year 1948.**—*Coun. Pap. Fiji* 24, pp. 31–35, 1949.

The following items of phytopathological interest occur in this report [cf. *R.A.M.*, 27, p. 9]. In field trials carried out at the departmental station, Ra, routine spraying with Bordeaux mixture controlled banana leaf spot disease (*Mycosphaerella musicola*) and other [unspecified] banana pathogens [ibid., 18, p. 92]. Fruit from the sprayed plots proved much less susceptible to stem-end rot [ibid., 18, p. 41] and other transport diseases and ripened much more satisfactorily in New Zealand than fruit from unsprayed plants. A field campaign for control of *M. musicola*, which was again prevalent in several banana areas, was arranged to commence after the rains in 1949.

A destructive disease of dalo (*Colocasia esculenta*) and other Aroids caused by *Phytophthora colocasiae* was recorded for the first time in Fiji in the Tamavua area. Good control was obtained by spraying the infected field and adjacent plots with Bordeaux mixture. During 1949 this disease was reported to be causing great destruction to dalo crops in the Solomon Islands [ibid., 27, p. 407] and a warning was issued locally against introducing plant material into Fiji. The origin of the Fiji outbreak is not explained although weather conditions were very favourable for the rapid development and spread of the disease.

Fusarium oxysporum on potatoes was less severe than in recent years, probably due to the greatly increased use of certified seed as a result of departmental propaganda. An inspection of the potato areas revealed that several growers are incurring losses by growing potatoes repeatedly in the same field.

Tomato wilt caused by *Fusarium* [*bulbigenum* var.] *lycopersici* [ibid., 14, p. 337] was probably the most widespread and troublesome disease encountered; in several cases the whole crop was destroyed.

SCHANDERL (H.). **Botanische Bakteriologie und Stickstoffhaushalt der Pflanzen auf neuer Grundlage.** [Botanical bacteriology and the nitrogen metabolism of plants on a new basis.]—198 pp., 46 figs., Stuttgart, E. Ulmer, 1946. [Abs. in *Biol. Abstr.*, 23, 9, p. 2856, 1949.]

The author adduces evidence which leads him to conclude that the interior of plant cells is not free from living organisms [cf. *R.A.M.*, 28, p. 273]; for example, bacteria appeared when sterilized plant tissue was placed in nutrient solutions. Mitochondria are regarded as bacterial symbionts of the plant cell, becoming free-living bacteria only under special conditions.

Dowson (W. J.). **Manual of bacterial plant diseases.** –viii + 183 pp., 32 pl., 18 maps, London, A. & C. Black, Ltd., 1949. 16*s*.

This comprehensive text-book contains information for the identification of bacterial plant pathogens for the benefit of students of plant pathology, and for workers concerned with diagnosing plant diseases and advocating control measures. The author deals with the nomenclature and classification of the bacteria concerned [cf. *R.A.M.*, 21, p. 364; 28, p. 512] and gives some of the results of recent investigations made by himself and his research workers. All the known diseases occurring in Britain, and those most important in the Dominions, Colonies, and Dependencies are included, the account of each disease concluding with references to the more important and recent investigations.

Part I (Chapters I to IV) deals with general characters, classification and nomenclature, disease symptoms, and the principles and methods of investigation. Part II (Chapters V to VII) is concerned with media, their pH adjustment, preparation and sterilization, and indicators; physiological characters and biochemical activities of bacteria; and staining methods. Part III (Chapters VIII to XII) is devoted to the diseases, which are treated in order of the genera of the bacterial plant pathogens concerned, the species being arranged under the sections, vascular diseases, systemic diseases, &c. At the end a short account is given of the more common saprophytic bacteria constantly encountered in the process of isolation. The following new names are proposed [cf. loc. cit.]: *Pseudomonas syringae* f. sp. *prunicola* n. comb. (syn. *P. prunicola*), *P. medicaginis* f. sp. *phaseolicola* n. f. sp. (syn. *P. medicaginis* var. *phaseolicola*), *P. savastanoi* f. sp. *fraxini* n. f. sp. (syn. *P. savastanoi* var. *fraxini*), *P. savastanoi* f. sp. *nerii* n. f. sp. (syn. *P. savastanoi* var. *nerii*), *Bact. lathyri* n. comb. (syn. *Erwinia lathyri*). The genus *Erwinia* is rejected and *Bacterium* is retained [ibid., 28, p. 322] and includes *Bact. amylovorum*, *Bact. carotovorum*, and *Bact. lathyri*. The author concludes that *Bact. carotovorum* and *Bact. phytophthorum* are strains of the same organism and that *Bact. aroideae* is a non-gas-forming strain of the same species, for which the name *Bact. carotovorum* is retained. *Xanthomonas rubrilineans* is transferred to *P. rubrilineans* and *X. solanacearum* to *P. solanacearum*; *X. gummisudans* is accepted. The C.M.I. geographical distribution maps of the principal diseases are reproduced and some of the diseases are illustrated by excellent photographs.

Meiffren (M.). **Swollen shoot, maladie du Cacaoyer.** [Swollen shoot, a disease of Cacao.]—*Agron. trop.*, 4, 11–12, pp. 563–578, 4 pl., 1949.

In this account of cacao swollen shoot [*R.A.M.*, 29, pp. 13, 14] the author gives a survey of recent information from the literature and describes the symptoms of the two forms of the disease found on the Ivory Coast [ibid., 27, p. 557]; the Kongodia type, which kills the tree in about two years, is characterized by opaque lesions and the Sankadiokro type by translucent lesions. The former type is accompanied by frequent leaf tip necrosis; at Kongodia there are also swellings, at Issia not. In the second type necrosis of the leaf tip is rare; at Bassam-Adzope large and small leaf spots are present, but no feathery mosaic. At Daloa, Issia, Duekque, Sankadiokro, Appropronu, and Yakasse large and small spots and the feathery mosaic are found; in the first three areas the lesions are separated from the veins by a dark green band and pod mottling is common, whereas in the last three the lesions are close to the veins and pod mottling is uncommon. Inoculation with the Sankadiokro form of the disease affords no protection against the Kongodia form. The latter appears to be a variant of the New Juaben strain (A) [ibid., 27, p. 178], but more difficult to transmit. On the Ivory Coast control of this virulent form should be attempted by cutting out the affected trees as rapidly as possible [ibid., 28, p. 277]. The Sankadiokro form develops slowly in the plant but spreads rapidly

from tree to tree, the number of affected trees being quintupled in four years. Natural hosts of the virus not previously recorded are the baobab [*Adansonia digitata*], *Ceiba pentandra*, *Bombax buonopozense*, *Sterculia rhinopetala*, and *S. tragacantha*.

GOODALL (D. W.). **Virus diseases of Cacao in West Africa. IV. Effect of virus infection on growth and water content of Cacao seedlings.**—*Ann. appl. Biol.*, 36, 4, pp. 440–447, 1949.

In experiments conducted at the West African Cacao Research Institute, Tafo, Gold Coast, cacao seedlings developing from embryos inoculated with the swollen shoot viruses [*R.A.M.*, 27, p. 515; 29, p. 14] were compared with apparently healthy ones. With the appearance of foliar symptoms the net assimilation rate was reduced, the proportion of dry matter represented by the leaves began to decrease, and the leaf area ratio declined, so that the relative growth rate was affected proportionately more than the net assimilation rate. At a slightly later stage lateral roots were proportionately less developed and some were necrotic. As the proportion of the dry matter in the leaves and lateral roots decreased, that in stems and tap root increased, suggesting that the virus had a less adverse effect on protoplasmic synthesis (or reserve storage) in the latter. The characteristic symptom of swelling indicates that the virus may even stimulate cambial activity in the stem and root. There is some evidence that infection retards translocation of reserves from the cotyledons and accelerates their abscission. It reduces water content in all parts of the plant, especially the stem.

GARRETT (S. D.). **The control of take-all under intensive cereal cultivation.**—*J. Minist. Agric.*, 56, 11, pp. 514–516, 1950.

The most important means of controlling take-all (*Ophiobolus graminis*) is the adequate use of artificial fertilizers [*R.A.M.*, 28, p. 168 and above, p. 247]. Substantial increases in the current rates of nitrogen application are advised for spring-sown wheat and barley and for the early spring top dressing of winter wheat. The second white straw crop especially should receive a heavier dose of nitrogen than is usually applied. On light soils this crop should always be spring-sown, because the interval between harvest and autumn drilling is too short to reduce the fungus surviving in infected roots and stubble. The Chamberlain system [ibid., 27, p. 182] also proved very effective in controlling the disease. An alternative but less preferable method is to plough in straw along with the stubble, and give increased nitrogenous fertilizer at sowing (1 cwt. nitrogen per 4 tons straw).

MACHACEK (J. E.). **Weeds in relation to the results obtained from seed treatment in cereals and Flax.**—*Abs. in Phytopathology*, 39, 10, p. 861, 1949.

The application of new improved ceresan to diseased wheat, oats, and barley seed grain in weed-free experimental plots [in Manitoba] increased the yields by 13, 9, and 33 per cent., respectively, as against 77, 62, and 83 per cent., respectively, in plots previously sown with Argentine rape seed as an artificial weed. In the case of flax [*R.A.M.*, 28, p. 172] the same treatment decreased production by 13 per cent. in clean plots but raised it by the same amount in weedy ones.

VANTERPOOL (T. C.). **The effect of temperature on chlorotic banding of cereals.**—Abs. in *Proc. Canad. phytopath. Soc.*, 17, p. 13, 1950.

Chlorotic banding of spring-sown cereal seedlings is seen frequently in the Prairie Provinces and in some seasons may be quite extensive and severe when soil surface temperatures are at or near freezing point. There are three stages of severity: (*a*) yellow, chlorotic banding of the first and second leaves; (*b*) bleached, dead

banding, commonly resulting in a break-over of the leaves; (*c*) complete collapse of the seedling at soil level. The same symptoms were produced experimentally with high soil surface temperatures (*a*) at 42° to 45° C., (*b*) up to 52°, and (*c*) at 52° to 54°. Such temperatures are common on clear, hot days. The chlorotic bands take up to ten days or more to become green. White spot lesions do not recover, but the later development of such seedlings is not noticeably affected. Injury to the growing point has fatal results. Slightly higher rates of sowing for late-sown cereals should insure against reduction in stands due to heat.

Tinline (R. D.), Sallans (B. J.), & Simmonds (P. M.). **The perithecial stage of Helminthosporium sativum.**—Abs. in *Proc. Canad. phytopath. Soc.*, 17, p. 16, 1950.

Perithecia [? of *Ophiobolus sativus*: *R.A.M.*, 8, p. 438] with mature ascospores were obtained by pairing certain cultures of 56 monoconidial isolates of *Helminthosporium sativum* from various parts of Saskatchewan [see next abstract].

Sallans (B. J.) & Tinline (R. D.). **Pathogenicity tests of isolates of Helminthosporium sativum on Wheat varieties.**—Abs. in *Proc. Canad. phytopath. Soc.*, 17, p. 16, 1950.

At the Dominion Laboratory of Plant Pathology, Saskatoon, eight wheat varieties appeared to react similarly to some or all of the 56 isolates of *Helminthosporium sativum* [*R.A.M.*, 28, p. 622 and preceding abstract] used in laboratory tests, although varietal differences were quite evident and the isolates possessed varying degrees of pathogenicity. In testing wheat varieties for resistance to this organism, however, it may be necessary to use only one or two isolates known to be definitely pathogenic.

Vik (K.). **Ni års forsøk med nye sorter og linjer av Vårkveite i sammenlikning med eldre sorter.** [Nine years' experiments with new varieties and selections of spring Wheat in comparison with older varieties.]—Reprinted from *Meld. Norg. LandbrHøjsk.*, *1948*, 32 pp., 1948. [English summary. Received January, 1950.]

The results of 114 experiments, covering the period from 1937 to 1945, in the breeding of spring wheat in south-eastern Norway are tabulated and discussed. The new varieties used are descendants of different crosses, in most of which the selection JO3, resistant to mildew (*Erysiphe graminis tritici*) [*R.A.M.*, 17, p. 383], served as one of the progenitors. The trials culminated in the release of two varieties, Ås II and Snøgg II, derived in the first instance from JO3 × Sibirian: both are prolific and resistant to loose smut (*Ustilago tritici*). Four new lines, viz., *0617–26* (Rubin × JO3), *M36* (JO3 × Aurore), *Æ 11* (JO3 × winter wheat), and *U60* from ((Ås × spring rye) × Mo 07) × Fram I), are all resistant to both diseases but inferior to Ås II in productivity and strength of straw.

De Vilmorin (R.). **Traitement pratique des charbons internes des céréales.** [Practical treatment of the internal smuts of cereals.]—*C. R. Acad. Agric. Fr.*, 36 [? 35], 16, pp. 674–675, 1949.

A description is given of a machine designed by the author for the hot-water treatment of wheat seed against *Ustilago nuda tritici* [*U. tritici*: *R.A.M.*, 29, p. 148] and barley seed against *U. nuda hordei* [*U. nuda*: ibid., 28, p. 121]. It consists of one 1,600 l. tank and one 200 l. for treatment at 45° [C.] and 51·5°, respectively. Two parallel, horizontal chains running along the sides carry the seed baskets at different levels. At one end of the large tank a wheel raises the baskets up one stage,

and they then start a return journey in the opposite direction taking two hours to complete the circuit. There is no pause in the passage of the baskets from one tank to the other. The whole apparatus measures 3 by 1·5 by 1·6 m. and is enclosed in a temperature-controlled chamber measuring 4 by 3 by 2 m. It weighs, when empty, 3 tons, and treats 150 kg. of seed per hour. The movement and heating are electrically controlled. The water is stirred continuously, horizontally and vertically, by a pump. On emergence the water content of the seed is reduced to 14 per cent. by drying in hot air in two stages of four hours each, separated by a cooling period of eight hours. Germination of about 1,000 quint. of treated seed was 75 per cent., and no damage appears to have been sustained. Only seed for multiplication purposes is treated, and it is hoped by this method to continue the use of popular, good-quality, susceptible varieties of wheat and barley.

Holton (C. S.) & Sprague (R.). **Studies on control of snow mold of winter Wheat in Washington.**—Abs. in *Phytopathology*, 39, 10, p. 860, 1949.

The following practices have been found to reduce the losses, ranging from $25,000 to $300,000 annually, caused by the snow moulds *Typhula idahoensis*, *T. itoana* [*R.A.M.*, 19, p. 434], and *Fusarium nivale* [*Calonectria nivalis*], in Douglas and Lincoln counties, Washington. Sowing in August instead of September permits the formation of large roots and crowns, which assist in the recovery of the plants even when all the leaves are killed. Weeds in mould-damaged stands should be suppressed by spraying with herbicides. Small quantities (up to 60 lb. per acre) of fertilizers, e.g., pelleted ammonium phosphate and ammonium nitrate, applied after the melting of the snow, tend to promote regeneration. In March, 1948 and 1949, the application of black superphosphate or lamp black at 500 lb. per acre helped to melt the snow and reduced mould activity. The use of spergon, phygon, and puraturf at 80 lb. per acre in mid-October of both years resulted in 95 to 100 per cent. control.

Coffman (F. A.), Rodenhiser (H. A.), & Taylor (J. W.). **New varieties for the northern winter Oat region.** —*Agron. J.*, 41, 12, pp. 551–554, 1949.

Numerous oat selections and crosses have been made in the hope of obtaining substitutes for the exceptionally vigorous Lee, which for the last 25 years has been the leading autumn-sown variety in a region comprising parts of Maryland, Virginia, North and South Carolina, and Georgia, but it is susceptible to smut [*Ustilago avenae* and *U. kolleri*] and to stem and crown rusts [*Puccinia graminis* and *P. coronata*]. Hitherto the most valuable hybrids in this area have been Stanton Strain 1, Letoria, and De Soto, which are resistant to many races of smut attacking Lee, but susceptible to *Helminthosporium victoriae* [*R.A.M.*, 29, p. 151]. Since 1937 crosses have been made between Lee-Victoria types and Fulwin, and three promising hybrids are now available named Atlantic (C.I. No. 4599), Arlington (C.I. No. 4657), and Coy (C.I. No. 4600), of which the first two are resistant to the common races of *P. coronata* and oat mosaic virus [ibid., 29, p. 94], though susceptible to the locally less destructive *P. graminis*, as well as to *H. victoriae*.

Stanton (T. R.). **Registration of new varieties and strains of Oats, XV.**—*Agron. J.*, 42, 1, pp. 46–52, 1950.

This is a full account, accompanied by complete statistical data in tabular form, of the characters (including disease resistance) [see preceding abstract] and performance in the United States of eight varieties of oats submitted and approved for registration since the publication of the last report [*R.A.M.*, 24, p. 498]. They are Clinton, Benton, Mindo, Bonda, Eaton, Forkedeer, Osage, and Neosho (Reg. Nos. 105 to 112) [ibid., 26, p. 390; 27, p. 181; 28, p. 116; 29, p. 151].

Lawas (O. M.) & Fernandez (W. L.). **A study of the transmission of the Corn mosaic and of some of the physical properties of its virus.**—*Philipp. Agric.*, 32, 3, pp. 231–238, 3 figs., 1949.

The writers' study on the mosaic of maize caused by the sugar-cane mosaic virus, covering the period from December, 1946 to May, 1948, was undertaken primarily to record the occurrence of the disease in the Philippines and its methods of transmission [*R.A.M.*, 16, pp. 125, 515].

The incubation periods of the virus in transmission experiments with crushed tissues, pin pricks [ibid., 29, p. 121], and sap were 8 to 28, 4 to 31, and 5 to 17 days, respectively. The first method resulted in the infection of a number of plants, the second in 16·6 to 90 per cent., and the third in 62 to 85 per cent. Transmission was further effected through the agency of *Aphis maidis* [ibid., 26, p. 419] and *A. gossypii*, of which the latter (apparently not previously recorded here as a vector of this mosaic) was the more efficient. The minimum number of aphids of this species necessary for transmission was three and the requisite incubation period 12 to 23 days. In reciprocal transmission experiments the virus was rapidly conveyed to *Eragrostis amabilis*, *Paspalum conjugatum*, *Digitaria corymbosa*, *Eleusine indica*, *Dactyloctenium aegyptiacum*, sorghum, and *Andropogon halepensis*. The symptoms, which closely resembled those on maize, appeared after an incubation period of 10 to 27 days. The mosaic of *Musa textilis* caused by *Marmor cucumeris* [cucumber mosaic virus: ibid., 20, p. 465] was transmitted by *Aphis maidis* to maize and its own host. *A. gossypii* was used to transmit sugar-cane mosaic virus from maize to *M. textilis* on which it produced symptoms differing from those due to cucumber mosaic virus. The mosaics of *Cymbopogon nardus*, *P. conjugatum*, and *Rottboellia exaltata*, also probably due to sugar-cane mosaic virus, were transmitted mechanically to maize, on which each produced symptoms closely resembling those caused by sugar-cane mosaic. The latter, of minor importance in itself, may constitute a troublesome source of infection of neighbouring sugar-cane plantations.

Reitsma (J.) & Karthaus (J. P.). **Onderzoek naar de resistentie van verschillende Maisvariëteiten tegen omo lijer of bulai (Sclerospora maydis Palm).** [Study on the resistance of different Maize varieties to 'omo lijer' or 'bulai' (*Sclerospora maydis* Palm).]—*Meded. alg. Proefsta. Landb., Batavia*, 89, 20 pp. 2 diags., 1949. [English summary.]

The most destructive disease of maize in Indonesia is downy mildew (*Sclerospora maydis*) [cf. *R.A.M.*, 7, p. 308; 29, p. 21], the symptoms of which, as described by Palm (*Meded. Inst. PlZiekt., Buitenz.*, 32, 78 pp., 1918), fall into three types. In the first the diseased plants are stunted, with narrow, yellow or greenish-yellow leaves; in the second growth is normal, but the leaves bear yellow stripes radiating from a common centre at the base; and in the third the plants appear normal, only the basal leaves showing narrow, sharply delimited, yellow or brown stripes.

The writers' investigations confirmed the results of previous studies demonstrating the inefficiency of most control methods. The differential reaction to the disease of a number of maize varieties were therefore examined, using the following effective inoculation technique. Vigorous seedlings were planted in tins and a week later the tins were transferred to glass cylinders covered with blotting paper and exposed for 48 hours to infection by spores falling from bits of diseased leaves. The tins were then kept for seven hours at 12° to 13° C., after which the seedlings were potted in soil. Another method, termed 'contact infection', consisted in the interplanting of healthy seedlings between rows of inoculated plants.

The influence of external factors on the course of infection was studied by growing one lot of seedlings in a frame in the greenhouse and another under cover in a shaded outdoor position. Once the plants were inoculated with spores environ-

mental conditions exerted little or no effect on the development of the disease. 'Contact infection', on the other hand, was found to depend for its success on a high degree of humidity. Thus, in three tests at 40-day intervals the incidence of infection in 150 inoculated plants in the greenhouse was 102 (68 per cent.), 81 (54), and 97 (64·7), respectively, the corresponding figures for those kept in the shade being 91 (60·7), 107 (71·3), and 99 (66), respectively. The numbers of uninoculated greenhouse plants (out of 300) developing infection in the three tests were 12 (4 per cent.), 17 (5·7), and 9 (3), respectively, as compared with 209 (69·7), 190 (63·3), and 166 (55·3), respectively, in the shade. Under humid conditions the foliage of diseased plants became covered with a white mass of sporangia.

Further large-scale trials demonstrated the applicability of the contact infection method in practice, and it was accordingly used in 1941 to determine the reactions to *S. maydis* of the varieties available in that year. They ranged (under shade) from very susceptible (80 to 100 per cent.) to highly resistant (0 to 20), the former category comprising Delwetan, Improved Leaming, Morocco, Popcorn, and Stowell's Evergreen, and the latter Bakoe-Bakoe, Kodok, Entog, and Gendoe. The standard White Central Java variety, which was very resistant in field experiments in 1939 and 1940, contracted 30 to 40 per cent. infection in these trials. The same rating was assigned to Impa-Kimpa, Ngale, Calamba (all very resistant in the field), and Yellow East Java. Maja (another standard variety) developed 40 to 50 per cent., Yellow Menado and St. Croix 50 to 60, Saipan 60 to 70, and Durum (the source of inoculum), No. 491, and No. 120 70 to 80. In field tests, when the same varieties were exposed to heavy infection by planting them in groups of 12 round a diseased individual, the incidence of infection tended to be much lower than when they were grown in an atmosphere of continuous humidity.

[This paper is also published in *Landbouw*, 21, pp. 427–444, 1949.]

Klotz (L. J.) & Fawcett (H. S.). **Color handbook of Citrus diseases. Second edition.**—119 pp., 53 pl. (51 col.), California University Press; London, Cambridge University Press, 1948. 52*s.* 0*d.*

This loose-leaf handbook [cf. *R.A.M.*, 22, p. 131] has been revised and expanded to include 14 further maladies and it provides a ready means of identifying 95 diseases and disorders of citrus. The symptoms are described and their effects illustrated by means of the excellent coloured plates. Those of psorosis and quick decline are of particular merit.

La gommose ou les gommoses des Aurantiacées. [Gummosis or gummoses of the Aurantieae.]—*Rev. franç. Oranger*, 19, 202, pp. 165–166, 1949. [Abs. in *Docum. analyt.* (Suppl. to *Fruits d'Outre-Mer*, 4, 11), 7, 1, p. 12, 1949.]

In this paper, edited by Wyss-Dunant, it is stated that the species of *Phytophthora* [*R.A.M.*, 28, p. 62], which cause gummosis of orange trees, effect entry through wounds and develop between the bark and the phloem, rapidly encircling the trunk or branch. The gum secreted impedes the movement of the sap. The viability and virulence of the fungus are favoured by the acidity and humidity of the soil and the amount of nitrogenous material. Dryness and oxygen, on the other hand, are inimical to the fungus; fertilizers containing phosphates and lime arrest the growth of the mycelium in the soil. Parasitic gummosis originating in wounds is distinguished from the physiological form, which may be general or localized and have one or more foci on the same tree.

Calavan (E. C.). **Lemon tree collapse.**—Abs. in *Phytopathology*, 39, 10, pp. 858–859, 1949.

Lemon tree collapse, which is externally similar to quick decline of oranges [*R.A.M.*, 28, p. 563], has been under investigation for three years in southern

California. A prolonged period of rootstock starvation is followed by collapse, generally between 15th December and 1st June. Outward symptoms include a twisting leaf roll succeeded by slight to extreme wilt, excessive output of small, prematurely coloured fruits, lack of growth, sloughing of bark from the rootlets, and frequently chlorosis of the leaves and partial defoliation. Grapefruit and sweet orange rootstocks are the most likely to give rise to lemon collapse, which may be accompanied by shell bark [ibid., 27, p. 471]. Some trees die soon after wilting, while others establish an equilibrium and recover to some extent. Bacteria and fungi, e.g., *Pythium ultimum* and *Fusarium solani*, are common on the roots of both diseased and healthy trees. No evidence of natural spread in the field has been obtained. Transmission tests by budding produced no positive reaction in 13 months. The Eureka variety appears to be the most susceptible.

Wallace (J. M.). **Inoculation technique, incubation period, and early symptoms of the quick decline disease of Citrus.**—Abs. in *Phytopathology*, 39, 10, pp. 863–864, 1949.

The destruction of the phloem tissues of sweet orange trees grafted on sour orange rootstocks suffering from quick decline [in California: see preceding abstract] induces the development of girdling symptoms. One- to two-year-old trees do not usually develop conspicuous top symptoms until 12 to 15 months after infection, but young trees flower and fruit prematurely, sometimes within 8 to 10 months. A shorter test is required, particularly for use in the search for the one or more insect vectors of the virus. Young trees inoculated in September and drastically cut back produced a flush of new leaves before entering winter dormancy. In the following January they showed small, discoloured leaves, absence of stored starch in the roots, and slight rotting of the feeder roots. Healthy controls similarly pruned were normal. The vigorous growth of young trees in the spring and summer may preclude any acceleration of symptom expression by the inoculation technique described, but it is hoped, by means of certain modifications in the methods, to provide a short-time test for quick decline transmission.

Gayford (G. W.). **Mildura district field day. Citrus fertilizer and rootstock experiments.**—*J. Dep. Agric. Vict.*, 47, 12, pp. 562–563, 1949.

D. M. McAlpin reports that many trees on citronelle (rough lemon) and sour orange stocks in trials planted in 1934 at Irymple, Victoria, are unhealthy or dead, the former being affected mostly by boron poisoning [*R.A.M.*, 28, p. 454]. Bud union decline [ibid., 27, p. 419] is now known to be a virus disease spread by the common black citrus aphis (*Aphis tavaresi*) [cf. ibid., 28, p. 522].

Michelmore (A. P. G.). **Report on Coffee Entomology and Pathology, 1946–1948.**—Entebbe, Uganda Protectorate, 15 pp., 1949.

In the section of this report dealing with maladies of coffee (pp. 10–14) the following disorders are described. Arabica coffee on the eastern side of Ruwenzori suffers from a berry blister, not previously described. A rot develops under the blister-like swellings in the pericarp and spreads until the whole bean is mouldy. It appears that the mould [unspecified] spreads outwards from the bean and causes collapse of the blister, and that maggots constantly associated with it are probably the primary cause.

Corky pulp disease occurs only on Robusta coffee and was observed at Kawanda, Bugunda, and Bwamba, where individual trees were severely affected. It attacks fruits which are approaching full size. After slight local yellowing the skin splits, dries, and peels, revealing a dry, white or brown, powdery tissue below. The decay of the pulp spreads and ultimately the beans shrivel and die. The disease was nearly always found associated with a boring insect (*Stephanoderes*), but occasionally occurs without it, and it is assumed that the entry of the pathogenic agent is facilitated by

the borer. Shedding [cf. *R.A.M.*, 26, p. 233], causing considerable losses both in Robusta and Arabica plantations in many districts, is mainly a physiological disorder. Many of the shed cherries have a mealy pulp, similar to that caused by corky pulp disease.

An uncommon disease of unknown etiology is cherry split, occurring on Arabica plants in the west. The unripe cherry splits down one side, revealing black and rotten tissue.

Two forms of superficial yellow spotting of ripe berries occur on Arabica trees on Mt. Elgon: yellow pits with brown centres caused by brown blight, the mild form of *Colletotrichum coffeanum* [*Glomerella cingulata*: ibid., 27, p. 280], and 'yellow blotch of cherry', of unknown cause. Matt streaking of the skin of cherries is common, but seems to be harmless. A berry disease, probably caused by a fungus, causes drying-up of the cherries, but is not serious.

Arabica and Robusta coffee leaves in many areas show mosaic-like symptoms. Between the main veins there are translucent, yellowish, anastomosing lines, which may later turn brown. In severe cases the leaves become distorted and dwarfed. Usually the vigour of the plant is not affected, but occasionally the internodes are shortened and the bush dwarfed and dense. The disease attacks mostly adult trees, but has also been found in a nursery. In Robusta sometimes the leaf is long and narrow, and curled inwards spirally. Occasional trees are stunted, dense, and seem to bear little, but usually the disease does not affect the crop. The disorder occurs in most areas, but is especially severe in the northern half of Masaka district. It has been present in the country for many years and is not serious.

Another disease of which no previous record has been found is the strap-leaf malady of Arabica seedlings. It appeared first on Mt. Elgon but extends now right across the coffee belt from east to west. The leaves are narrowed and sometimes distorted, in severe cases the internodes are shortened and the plants dwarfed, the foliage consisting of bunches of leaves only 1 in. long. The roots are not visibly affected. Some seedlings have recovered after being transplanted. Affected seedlings should be rogued out. The hot-and-cold disease [ibid., 16, p. 796] of unshaded Arabica trees is very common on the north side of Mt. Elgon, particularly on the eastern slopes. On some exposed plots all branches grow westwards, those on the east side being repeatedly killed back. Occasionally odd bushes with severe symptoms were found among normal ones. Sometimes one stem of a tree is severely damaged, while another is healthy. This suggests a virus infection.

GUILLEMAT (J.). **Quelques notes sur la flétrissure ou 'wilt' du Cotonnier due à Fusarium vasinfectum Atk.** [Notes on Cotton wilt due to *Fusarium vasinfectum* Atk.] —*Coton Fibres trop.*, 2, 1, pp. 17–27, 6 figs., 1947. [Received 1950.]

The author, with frequent references to the literature, gives a comprehensive account of the history of cotton wilt (*Fusarium vasinfectum*) [*R.A.M.*, 26, p. 543 *et passim*], and deals with the host range, symptoms, geographical distribution, economic importance, taxonomy, morphology, physiology, virulence, and biology of the causal organism, the host-parasite relationship, spore dissemination, and the influence of environmental factors on disease development. Methods of control [ibid., 26, p. 244] are treated in detail.

MILLIKAN (C. R.). **Effects on Flax of a toxic concentration of boron, iron, molybdenum, aluminium, copper, zinc, manganese, cobalt or nickel in the nutrient solutions.**—*Proc. roy. Soc. Vict.*, 61, N.S., pp. 25–42, 3 pl., 1949.

Water culture experiments carried out during 1943 to 1947 in Victoria showed that excesses of boron, iron, molybdenum, aluminium, copper, zinc [*R.A.M.*, 27, p. 21], manganese [ibid., 28, p. 288], nickel, or cobalt resulted in either death or

stunting of flax plants and discoloration of the tissues. Symptoms are described and the effects of the interactions of several of these elements elucidated.

Millikan (C. R.). **Studies of strains of Fusarium lini.**—*Proc. roy. Soc. Vict.*, 61, N.S., pp. 1–24, 1 pl., 52 graphs, 1949.

In comparative physiological and pathological studies of eight strains of *Fusarium lini* from Victoria and seven from Minnesota, carried out in Victoria [*R.A.M.*, 24, p. 505], progressive and significant increases in dry weight of strain D1–1 occurred in ten days with increases in concentration of sodium nitrate and glucose up to 8 and 30 gm. per l., respectively. Similar increases resulted when potassium dihydrogen phosphate (0·1 and 0·5 gm. per l.) and biotin (1γ per flask) were added. No further increases occurred at higher levels and 5γ biotin per flask reduced yield. Crystalline biotin methyl ester and dried yeast increased growth although not as much as biotin concentrate. Thiamine reduced yield. Nine strains of the fungus varied considerably in their response to biotin concentrate and all were capable in time of supplying their own needs of the one or more growth factors present in the vitamin. For the strain Minnesota 11 sucrose as the source of carbon gave significantly higher values for the maximum dry weight than dextrose. Growth of *F. lini* D1–1 occurred in solutions with initial pH values ranging from 2·73 to 7·6 [cf. ibid., 5, p. 441]. There was considerable variation between the 15 strains in growth rate and pH changes induced in the media when they were grown in two nutrient solutions of pH 7·2 and 4·5, respectively. Pathogenicity could not be correlated with the values of isometabolic points [ibid., 29, p. 46] characteristic of the various strains when grown in nutrient solutions. Typical wilt symptoms in flax were produced by filtrates of cultures, and in soil inoculation experiments all the strains used were pathogenic, although the general virulence of certain strains, e.g., Minnesota 15, 27, and 28, to the varieties studied was less than the others. These three strains reacted identically with Concurrent, Beladi, and La Prevision. The other test varieties were very different in their relative susceptibilities to the different strains, e.g., Russian × Argentine was highly susceptible to Minnesota 11 and resistant to 13 others; Ottawa 770B × Buda and Russian × Argentine D1 sel. were moderately resistant to D1–1, and D1–2, Rio was susceptible and Liral Crown sel. 1 very susceptible; Newland X (19 × 112) was very susceptible to D1–1 and resistant to D1–2. The various isolates could thus be distinguished by their pathogenicity to flax varieties. A variety may be resistant to wilt when grown in naturally infected soil, yet susceptible to an individual strain of *F. lini* isolated from that soil and vice versa. In any one variety there may be considerable differences between wilt-susceptible individuals in the time taken to develop wilt symptoms. The duration of wilt tests should therefore be sufficiently long (50 days) to enable all susceptible individuals to develop symptoms.

Borzini (G.). **Prima relazione sulla lotta contro l'Uromyces e l'Heterosporium del Garofano e l'Oidio della Rosa nella Riviera dei Fiori.** [First report on the control of *Uromyces* and *Heterosporium* of Carnation and of *Oidium* of the Rose in the flower-growing Riviera.] *Notiz. Malatt. Piante, 1949*, 2, pp. 1–3, 1949. [Mimeographed.]

Outdoor Gloria di Roma roses highly susceptible to *Sphaerotheca pannosa* [*R.A.M.*, 28, pp. 375, 635] when treated every ten days from the beginning of March to the end of April on the Italian Riviera were protected from the disease by ordinary sulphur dust, activated Rumianca sulphur dust, and Caffaro copper sulphurs Z.P.C./48 and C.B./1309. In tests against *Uromyces caryophyllinus* [ibid., 26, pp. 347, 491] and *Heterosporium echinulatum* [*Didymellina dianthi*: ibid., 28, p. 456] on carnations the best results were given by the Caffaro copper sulphur dusts Z.P.C./48 and C.B./1309, applied at intervals of 20 days from March to May.

Ciferri (R.). **Segnalazioni di attacchi della Ramularia vallisumbrosae Cav. sul Narciso coltivato nella Riviera ligure.** [Reports of attacks of *Ramularia vallisumbrosae* Cav. on Narcissus grown on the Ligurian Riviera.]—*Notiz. Malatt. Piante, 1949*, 6, p. 1, 1949. [Mimeographed.]

In the spring of 1949, during the wet period and that immediately following, *Narcissus tazetta* plants growing on the Ligurian Riviera became affected by white mould (*Ramularia vallisumbrosae*) [*R.A.M.*, 5, p. 343; 16, p. 319; 27, p. 134]. Early applications of Bordeaux mixture (1–1–100) or an insoluble copper salt were recommended.

Ciferri (R.). **Alcune malattie e anormalità dei Gladioli osservati in Italia.** [Some diseases and abnormalities of Gladioli observed in Italy.]—*Notiz. Malatt. Piante, 1949*, 2, pp. 17–22, 1949. [Mimeographed.]

Gladiolus yellows (*Fusarium orthoceras* var. *gladioli*) [*R.A.M.*, 23, p. 345], though important, appears to be declining in Italy, where it seems to be more common in Liguria than in Tuscany. The disease on the corms resembles dry storage rot caused by *F. oxysporum* var. *gladioli* [ibid., 19, p. 582; 28, p. 399], which occurs with some frequency. Leaf spot (*Septoria gladioli*) [ibid., 28, p. 455] is one of the commonest *Gladiolus* diseases, but does not cause severe damage unless the infection occurs early. At San Remo a leaf spot was noted closely resembling in its symptoms that due to *Stemphylium* in the United States [ibid., 27, p. 566]. Brown leaf spots with a pale centre were associated with *Botrytis gladioli* [ibid., 28, p. 455]; this *Botrytis* has been reported only once before with certainty from Italy, in 1937. Bacteriosis attributed to *Bacterium gladioli* [ibid., 16, p. 302] is not uncommon and appears to be the only bacterial disease of *Gladiolus* present in Italy.

'Mild mosaic' is very common, especially on old varieties. Young plants sometimes show a slight mosaic, the symptoms of which usually disappear as spring approaches. These symptoms would appear to be due to the virus that causes mosaic in beans, clover, and other legumes [cf. bean yellow mosaic: ibid., 26, p. 275].

Not uncommonly corms, especially after storage, show greyish-black to black, superficial spots, which may be less than ½ cm. in diameter or cover more than a third of the surface of the corm, in which case they generally spread from the base to the apex. The affected parts dry up and turn black. The condition does not appear to have any adverse effect on the plants, but it reduces the commercial value of the corms. Isolations from affected corms (some from Holland) yielded saprophytes, especially a *Cladosporium*. Wet rot (*Penicillium gladioli*) [loc. cit.] occurs in storage.

Matheron (E. J.). **Controlling Carnation diseases.**—*N.Y. St. Flower Grs' Bull.* 49, pp. 11–12, 1949. [Abs. in *Chem. Abstr.*, 43, 22, p. 9338, 1949.]

The following procedure is recommended for the control of [unspecified] carnation diseases. As a rooting agent, 1 gm. indolebutyric acid mixed with 2 lb. powder is used. Treated cuttings are rooted in sand which has been liberally dusted with fermate and is changed for each successive batch. Transplanting is avoided as far as possible since it tends to spread infection. All young plants intended for indoor cultivation are dipped in a suspension of 2 lb. fermate per 100 gals. water. Phygon at 2 teaspoonsful per gal. water has also given promising results.

Waite (R.). **The relation between moisture content and moulding in cured hay.**—*Ann. appl. Biol.*, 36, 4, pp. 496–503, 1 graph, 1949.

In experiments at the Hannah Dairy Research Institute, Ayr, storage temperature and relative humidity of the storage atmosphere proved to be the chief factors affecting mould growth on cured hay [cf. *R.A.M.*, 27, p. 325]. Mould growth occurred on ½ to ¼ in. lengths stored at 70 per cent. and higher relative humidities

in the laboratory at 19° to 20° C. When placed outside for 54 days with temperatures varying from 0° to 10° C., visible mould was present only on hay stored at 90 and 95 per cent. relative humidity. When mould spores normally present on hay were plated and incubated at 5°, 15°, 25°, and 30° (100 per cent. initial relative humidity) colonies developed at 25° and 30° after 2 days and at 15° after 4 days. Spores are not likely to flourish at temperatures up to 15° provided the relative humidity is not much greater than 75 per cent. The moisture content of the hay is a function of the relative humidity of the storage atmosphere, and it is not greatly affected by temperature. Hay containing less than 15 to 16 per cent. moisture in summer and 18 per cent. in winter is unlikely to mould. The conditions of temperature and relative humidity in the open stackyard in Britain are not favourable to mould growth on well-cured hay.

Welsh (M. F.). **Coryneum blight of stone fruits.**—Abs. in *Proc. Canad. phytopath. Soc.*, 17, p. 12, 1950.

Coryneum blight, caused by *Clasterosporium carpophilum* [*R.A.M.*, 27, p. 75], is a severe limiting factor in peach and apricot production in the Canadian Kootenays, British Columbia, causing cankers on limbs and twigs during autumn rains, and fruit-spotting and foliage shot hole in spring and early summer. The fungus overwinters for at least two seasons in cankers and killed buds [see below, p. 265]. A spray applied during the third week in September has proved effective in eliminating canker formation in a single season. The development of a spring spray schedule is still being investigated.

Mulder (D.). **Voedingsziekten van vruchtbomen.** [Nutritional diseases of fruit trees.]—*Tijdschr. PlZiekt.*, 55, 5, pp. 272–278, 1949. [English summary.]

This is a general discussion of the nutritional diseases of fruit trees, an introduction to the subject being followed by sections on some characteristics of the disorders, the symptoms and their localization, the relation between symptoms and function, and the significance of autumn colouring in connexion with the nutritional status of the foliage. As a rule nitrogen, potash, magnesium, and manganese deficiencies are equally distributed over the entire tree, whereas those of iron, boron, and zinc tend to be localized on single branches. The value of chemical analysis of the leaves [*R.A.M.*, 27, p. 42] as an aid to the solution of fertilizing problems is emphasized.

Terrier (C.). **Biologie du champignon de la tavelure (Endostigme inaequalis (Cke) Syd.) et technique de traitements.** [Biology of the scab fungus (*Endostigme inaequalis* (Cke) Syd.) and the technique of treatment.]—*Rev. romande Agric., Vitic., Arboric.*, 6, 2 pp. 11–12, 3 figs., 1950.

In 1949, in a garden at Montagibert, Switzerland, it was found that perithecia of *Endostigme* [*Venturia*] *inaequalis* [*R.A.M.*, 28, p. 525], the causal organism of apple scab, were mature from 28th March onwards, but owing to low temperatures during rain spores were not emitted until after 25th April. Newly emerged leaves and those not sufficiently sprayed suffered severe infections. Under Swiss conditions primary infections do not usually take place after mid-June, the most critical period being blossom time. Fungicidal treatments should start very early, especially in rainy seasons; two pre-blossom treatments are advised, with further applications as long as there is danger from ascospore infection.

Crowdy (S. H.). **Observations on Apple canker. III. The anatomy of the stem canker.**—*Ann. appl. Biol.*, 36, 4, pp. 483–495, 1 pl., 4 figs., 1949.

In the third paper of this series [cf. *R.A.M.*, 19, p. 27] the development of apple cankers (*Nectria galligena*) is described from observations and anatomical studies at

Long Ashton Research Station of naturally occurring cankers on the susceptible varieties Worcester Pearmain and Cox's Orange Pippin. The pathogen exploits all the tissues outside the xylem and may also invade xylem parenchyma, vessels, and fibres. Barriers in the peripheral tissues laid down by wound phellogens are eventually passed by the mycelium either by direct penetration, which appears to be associated with an aggregation of the mycelium into blocks and with symptoms suggestive of mechanical rupture, or by growth into the lumen of the fibres. Spread is checked in the vessels by tyloses and gumming, and in the wood parenchyma by gumming, but in the fibres, where spread beyond the gum barriers was usually recorded, there appears to be no defence mechanism. The presence of the pathogen here might provide the explanation of canker formation on partially healed pruning cuts, which are described in detail. Canker development depends on the balance between the development of the pathogen and the resistance of the host. The control of the disease is discussed in relation to stimulated callus formation by the use of plant growth substances [ibid., 29, p. 32] and to weakened fungal growth after fungicide treatment.

Mellor (F. C.). **Crown rot of Apple—resistance trials.**—Abs. in *Proc. Canad. phytopath. Soc.*, 17, p. 15, 1950.

Artificial inoculation of nearly 3,000 apple trees, seedlings, and stocks representing 54 varieties in Vancouver, British Columbia, indicated that there is a wide range in varietal susceptibility to attack by *Phytophthora cactorum* [cf. *R.A.M.*, 24, p. 64]. Winter St. Lawrence was very susceptible, 24 out of 28 trees becoming badly rotted. Antonovka [loc. cit.] was practically immune; only 2 out of 212 trees were seriously affected.

Kessler (H.). **Versuche zur Verhütung der Hautbräune an Lagerobst.** [Experiments on the prevention of scald in stored fruit.]—*Schweiz. Z. Obst- u. Weinb.*, 58, 20, pp. 359–365, 1949.

A tabulated account is given of experiments conducted at Wädenswil, Switzerland, in 1948–9 to determine the efficiency of oiled paper (shredded or wrappers) [*R.A.M.*, 27, p. 137] in the control of apple scald [ibid., 28, p. 578]. The following are the results obtained. The incidence of slight, moderate, and severe scald in Sauergrauech after 110 days' open storage was 3·7, 14·9, and 80·7 per cent., respectively; in shredded paper impregnated with 15 per cent. of its weight of naphthene oil, 41·3, 40·4, and 7·2; with thick vaseline oil, 46·8, 27·9, and 11·5; with thin vaseline oil, 42·5, 39·7, and 8·9; with 1 : 1 paraffin-groundnut oil, 44·1, 30·5, and 8·3; and in wrappers treated with naphthene oil, 9·2, 34·7, and 55·3. The corresponding figures for Winterzitrone after 139 days' open storage were 34·1, 31·7, and 24·4, respectively; in shredded paper impregnated with naphthene oil, 38, 20·7, and 7·6; with thick vaseline oil 38·6, 14·9, and 5·9; with thin vaseline oil, 22·9, 20, and 13·3; with paraffin-groundnut oil, 30·4, 18·6, and 10·8; in wrappers treated with naphthene oil, 32·8, 34·4, and 15·4; with thick vaseline oil, 23·5, 29·4, and 27·5; and with paraffin-groundnut oil, 40·6, 18·7, and 12·5.

In open-stored Mörikers after 150 days there was 32·2 per cent. slight, 21·6 per cent., moderate, and 16·6 per cent. severe scald; in shredded paper impregnated with naphthene oil, 12·9 (slight only); with thick vaseline oil, 13·4 (slight only); with thin vaseline oil, 28·6 slight, 6·2 moderate, and 0·6 severe; with paraffin-groundnut oil, 25·6 (slight only); in wrappers treated with naphthene oil, 42·3, 19·2, and 3·8; with thick vaseline oil, 43·7, 23·2, and 9·8; with thin vaseline oil, 41·1, 20·5, and 18·7; and with paraffin-groundnut oil, 47·7, 22·5, and 6·3. The corresponding figures for Bohn after 190 days' open storage were 31·8, 15·5, and 0·5 per cent., respectively; in shredded paper impregnated with naphthene oil, 1·7, 0·6, and none; with thick vaseline oil, thin vaseline oil, and paraffin-groundnut oil,

1·2, 7·6, and 7·6 (all slight), respectively; in wrappers treated with naphthene oil, 9·8 slight and 4·5 moderate; with thick vaseline oil, 2·6 and 0·9, respectively; with thin vaseline oil, 16·4; and with paraffin-groundnut oil, 4·8 both slight only.

Incidentally the use of shredded oiled papers resulted in a substantial reduction of [unspecified] decay, especially in Sauergrauech and Winterzitrone. In the former variety the decay percentages were as follows: open, 63·8; naphthene oil, 13·6; thick vaseline oil, 9·5; thin vaseline oil, 7·1; and paraffin-groundnut oil, 8·7, the corresponding figures for the latter being 80·3, 34·6, 34·7, 23·6 and 41·5, respectively.

Kinman (C. F.) & Magness (J. R.). **Pear growing in the Pacific Coast States.**—*Fmrs' Bull. U.S. Dep. Agric.* 1739, 38 pp., 14 figs., 3 maps, 1949.

Bacterial blight of pears (*Erwinia amylovora*) [*R.A.M.*, 27, pp. 326, 429] is prevalent in most of the pear-growing sections of the Pacific Coast States. Weekly inspections are recommended and the immediate removal of infected spurs and branches and the cutting out of diseased areas on the large branches, crotches, trunks, and roots during the dormant season, using disinfected tools [cf. ibid., 14, p. 702; 19, p. 416]. It is also helpful to remove all root suckers and succulent water sprouts on the body of the tree in autumn or winter and adopt cultural and pruning practices that discourage vigorous wood growth. A pre-bloom spray containing fixed copper and wettable sulphur, followed by applications of a dust containing 20 parts of monohydrate copper sulphate and 80 parts of hydrated lime, at 30 to 40 lb. per acre should be tried. Dusting should begin when not more than 10 per cent. of the blossoms have opened and should continue throughout the flowering period at approximately weekly intervals, treatment being protracted to protect tender shoot growth if the weather favours infection. In addition, enough fixed copper or Bordeaux mixture is added to the first two codling moth (*Carpocapsa pomonella*) sprays to give a copper content of 1 in 3,000.

Venturia pirina [ibid., 28, pp. 159, 337, 461] often causes heavy reduction in yield and serious defoliation in areas with considerable spring rainfall. Two pre-blossom and two post-blossom sprays with Bordeaux mixture or lime-sulphur (summer strength) are recommended for control [cf. ibid., 25, p. 68 *et passim*]; on varieties severely damaged by these materials one of the milder sulphur sprays should be used.

Raeder (J. M.). **Fire blight. Coryneum-blight of stone fruits. Powdery mildew of Apples.**—*Trans. Idaho St. hort. Soc., 1949*, pp. 2–6, 1949. [Mimeographed.]

The author outlines the history, geographical distribution, hosts, symptoms, cause, and control of, and environmental effects on apple fireblight [*Erwinia amylovora*: *R.A.M.*, 28, p. 442; C.M.I. map no. 2], *Coryneum* blight of stone fruits [*Clasterosporium carpophilum*: see above, p. 262], and powdery mildew of apples [*Podosphaera leucotricha*: ibid., 29, p. 104].

Jones (J. O.). **Copper-deficiency disease of Pear trees.**—*Nature, Lond.*, 165, 4188, p. 192, 1950.

In September, 1948, the author observed a very severe die-back of the terminal shoots of vigorous young pear trees in a nursery [? in Kent], the symptoms corresponding to those caused by copper deficiency [*R.A.M.*, 23, p. 463]. During the winter all the dead wood was removed, and in May, 1949, 12 trees were sprayed with 0·1 per cent. copper sulphate solution. The treated trees developed no symptoms, while the untreated ones developed severe die-back in early August. The copper content of the leaves of the latter was less than half that of the sprayed trees.

McLarty (H. R.) & Woodbridge (C. G.). **Boron in relation to the culture of the Peach tree.**—Abs. in *Phytopathology*, 39, 10, pp. 860–861, 1949.

The outstanding features of boron deficiency, which may affect peach cultivation [*R.A.M.*, 17, p. 49] on virgin soils in the Okanagan Valley of British Columbia, are failure of the buds to break in the spring and a concomitant die-back of the twigs, branches, and sometimes of the whole tree. The boron content of affected twigs was shown by analysis to range from 4 to 8 p.p.m. A slight excess of the element, applied as a remedy, induces the formation of small, necrotic areas on the midrib or lateral veins of the leaves, while heavier treatments may cause death of the terminal growth, foliar chlorosis, severe cankering of the twigs and small branches, and malformation in the fruit. The boron content of cankered twigs was computed at 116 to 125 p.p.m.

Gaudineau (Marguerite). **Sur quelques maladies parasitaires (pourridiés, plombs, flétrissements) et leur incidence dans la 'mortalité des Pruniers'.** [Some parasitic diseases (root rots, silver leaf, wilts) and their occurrence in connexion with the dying of Plum trees.]—II[e] Congrès National de la Prune et du Pruneau, Agen, 21–23 Octobre, 1948, 6 pp., 3 figs., 1949.

The symptoms and economic importance of plum root rots (*Armillaria mellea* and *Rosellinia necatrix*) [*R.A.M.*, 28, p. 527], silver leaf (*Stereum purpureum*) [ibid., 9, p. 188], *Verticillium* wilt (*V. albo-atrum* and *V. dahliae*) [ibid., 7, p. 179; 12, p. 76], and *Monilia* [*Sclerotinia*] *laxa* [ibid., 27, p. 429] in France are discussed, together with control methods based on those applied in other countries.

Osterwalder (A.). **Knospen als Ansteckungsherde von Krankheiten.** [Buds as infection foci of diseases.]—*Schweiz. Z. Obst- u. Weinb.*, 58, 24, pp. 433–435, 2 figs., 1949.

It is not often recognized that *Clasterosporium amygdalearum* [*C. carpophilum*: *R.A.M.*, 27, p. 428] may be harboured in the buds of fruit trees. This fungus seldom produces spores on the leaf spots on cherry trees. In Switzerland they may be found, however, on the diseased, unilaterally sunken, misshapen cherries, on which they overwinter, and also in the gummosis wounds on the branches, whence the leaves often contract primary infection in the spring. Thus, despite its lack of overwintering organs proper, *C. carpophilum* contrives to perennate and reproduce, often to such an extent in a rainy, warm spring as to cause veritable epiphytotics on cherry trees [cf. above, p. 262].

Apricot leaves show the familiar circular lesions, later falling out, while small, round, rust-coloured, scabby spots are formed on the green fruits. On small, dry, leafless twigs, largely concealed by the dense foliage, are buds full of the spores of *C. carpophilum*, which spread to other apricots and stone fruits in the vicinity. A depression frequently marks the site of the passage of the fungus from the bud into the twig. Even more conspicuous are bud infections on young peach shoots, the dead buds, filled with spores, being surrounded by a brown to black zone, sometimes with slight gummosis. Pruning in early spring of the dry shoots with their infested buds is a means of control.

Nichols (C. W.). **The little Cherry and western X survey in Idaho for 1948.** —*Trans. Idaho St. hort. Soc., 1949*, pp. 19–23, 1949.

The results of the 1948 survey of the incidence of 'little cherry' in Idaho cherry orchards have already been noted [*R.A.M.*, 28, p. 69 and next abstract]. To date 7·2 per cent. of diseased trees have been removed. A survey of peach trees for western X-disease [? strain of peach X-disease virus] was made to investigate further the suggestion that little cherry and some manifestations of the western

X-disease may be due to the same virus [ibid., 28, p. 464]. Of a total of 29,376 peach trees inspected, 1,664 (5·6 per cent.) were found to be infected with western X-disease. A total of 3·2 per cent. diseased trees have been removed. [No conclusions are drawn regarding the relationship between the two diseases.]

Little Cherry disease threatens Idaho Cherry orchards.—*Circ. Idaho agric. Exp. Sta.* 113, 3 pp., 1 col. pl., 1948. [Received February, 1950.]

The history, distribution and symptoms of 'little cherry' virus disease are described. Plans are outlined for a survey and programme for the voluntary eradication of diseased trees in Idaho during 1948 [see preceding abstract].

Beatus (R.). **Entwicklungsgeschichtliche und cytologische Untersuchungen an Ascomyceten. II. Sphaerotheca mors-uvae (Schwein.).** [Phylogenetic and cytological studies on Ascomycetes. II. *Sphaerotheca mors-uvae* (Schwein.) [Berk.].]—*Z. Naturf.*, 3b, 1–2, pp. 42–55, 2 pl., 8 figs., 1949.

This is an exhaustive study on the phylogeny and cytology of the American gooseberry mildew pathogen (*Sphaerotheca mors-uvae*), based on material collected near Tübingen, Germany. The binucleate ascogonium divides into several binucleate cells, of which only one remains after the subsequent process of retrogression. The two nuclei fuse and give rise to the primary ascus nucleus, only the first division in which is a reduction, all the others being equation divisions. The chromosome figures agree with this conclusion. The haploid figure for *S. mors-uvae* is $n=4$.

Vaughan (E. K.). **Raspberry yellow rust control.**—Abs. in *Phytopathology*, 39, 10, p. 863, 1949.

Yellow rust of red raspberry (*Phragmidium rubi-idaei*) [*R.A.M.*, 25, p. 566] was effectively combated by fungicidal sprays in Oregon in 1948 and 1949. A single treatment was given when the buds had unfolded to about 1 in. and were beginning to show green. The number of aecidia on the leaves of bearing canes was only 1 to 10 per cent. of that on the unsprayed controls. The lowest incidence of infection at harvest was observed on the plants treated with phygon-XL [ibid., 28, pp. 284, 471, 483] and lime-sulphur, while almost equally good results were secured with elgetol, cop-o-zink, and fermate.

Thomas (H. E.). **The Strawberry virus complex.**—Abs. in *Phytopathology*, 39, 10, p. 863, 1949.

Using *Fragaria vesca* var. *californica* as an indicator plant, the viruses found in limited collections of strawberry plants, mostly of the Marshall variety, from the Pacific coast and eastern United States, have been indexed. Externally healthy Marshalls from the former region induced a set of symptoms termed 'mottle', comprising stunting and distortion of the foliage with some downward cupping, mild puckering, and moderate chlorosis with islands of green. The young central leaves may succumb to the initial shock. Crown necrosis is often observed, and the indicators become dwarfed. 'Mottle' appears to be a component of the strawberry yellows (xanthosis) [yellow edge] complex [*R.A.M.*, 28, pp. 69, 580]. An entirely different set of symptoms, designated 'droop', resulted from the inoculation of the indicator with juice from Marshalls from the eastern States, showing very mild marginal yellowing, namely, twisting, drooping, and curling of the young central leaves, leading to distortion and stunting of the crown, and sometimes accompanied by fruit chlorosis. No connexion has been established between the causal virus of 'droop' and that of yellow edge, the symptoms of which in the indicators were more severe than those of either 'mottle' or 'droop'.

Cabral (R. V. de G.). **Notas sôbre o 'Gloeosporium olivarum' Alm. II. Observações de campo.** [Notes on '*Gloeosporium olivarum*' Alm. II. Field observations.]—*Bol. Junta Azeite, Lisb.*, 4, 13–14, pp. 17–27, 1949.

A tabulated survey is given of observations on olive anthracnose (*Gloeosporium olivarum*) in the Sacavém district of Portugal [*R.A.M.*, 21, p. 496] in 1941. The fruits are the sole organs attacked, even in inoculation experiments. The disease generally appears after the first October rains, reaching a climax during that month and November and continuing until the end of December or into January. The fungus mostly attacks the fruits on the lower part of the tree. Another disease, resembling anthracnose in its symptomatology, was found to be caused by a *Fusarium*, possibly *F. microphlyctis*.

Cesaroni (F.). **Il mosaico del Fico in Liguria.** [Mosaic of the Fig in Liguria.]—*Notiz. Malatt. Piante, 1949*, 2, p. 29, 1949. [Mimeographed.]

Fig mosaic [*R.A.M.*, 27, p. 528] was found at La Spezia, Liguria, in 1948, on the outermost suckers at the base of a recently pruned vine, the most conspicuous spots being largely confined to the lowest third of the suckers. Affected leaves dried up and were difficult to detach; some were more rigid than normal. The condition was transmitted by bud-grafting.

Ciferri (R.) & Scaramuzzi (G.). **Saggi dell' attività anticrittogamica dei polisolfuri di polietilene in testi di laboratorio e contro l'Oidio del Tabacco.** [Experiments on the fungicidal activity of the polyethylene polysulphides in laboratory tests and against *Oidium* of Tobacco]—*Notiz. Malatt. Piante, 1949*, 2, pp. 11–15, 1949. [Mimeographed.]

In laboratory tests an aqueous suspension of polyethylene polysulphide reduced the germination of *Fusarium solani* conidia [cf. *R.A.M.*, 25, p. 402] to about the same extent as calcium polysulphide containing an equivalent amount of sulphur, the estimated percentage reductions in germination in the dark for the two materials containing 4, 2, 1, 0·5, and 0·25 per cent. sulphur being, respectively, 83, 68, 64, 37, and 4, and 92, 89, 85, 8, and 0; the corresponding figures in artificial light were 85, 70, 21, 9, and 5, and 80, 68, 24, 20, and 6. Polyethylene polysulphide (solution, wettable dust, or liquid suspension, each containing 1 per cent. sulphur) caused reductions in germination of *Clasterosporium carpophilum* conidia ranging from 4 to 24 per cent. The differences in fungicidal effectiveness between the various polymers of the polyethylene polysulphides whether used as dusts, solutions, or suspensions, are not marked.

In tests against *Erysiphe cichoracearum* on Burley tobacco seedlings, using Scaramuzzi's method of estimating the degree of control obtained [ibid., 29, p. 60] and solutions, suspensions, or dispersions of polyethylene polysulphides, it was found that of eight products (each with 1 per cent. sulphur) one gave an index of control of +99, while the average for seven of the eight was +84. At 1 per cent. the fungicidal efficiency of the polyethylene polysulphides was equal or frequently superior to that of wettable sulphur, while at 0·5 per cent. it was, on the average, less.

Pfleger (R.), Schraufstätter (E.), Gehringer (F.), & Sciuk (J.). **Zur Chemotherapie der Pilzinfektionen. I. Mitteilung: In-Vitro-Untersuchungen aromatischer Sulfide.** [On the chemotherapy of fungal infections. I. Note: *in-vitro* investigations of aromatic sulphides.]—*Z. Naturf.*, 4b, 6, pp. 344–350, 1949.

Tabulated results are presented of systematic investigations into the fungistatic and bacteriostatic activity of various new aromatic sulphides, mostly diphenylsulphide derivatives, detailed descriptions of which are given. The test fungi used were *Trichophyton gypseum* and *Torulopsis minor*.

Kepner (R. A.) & Leach (L. D.). **A continuous spray-type seed treater.**—*Agric. Engng, St. Joseph, Mich.*, 30, 11, pp. 519–523, 527, 2 figs., 2 diags., 1 graph, 1949.

The results of preliminary trials with laboratory models at the California Agricultural Experiment Station, Davis, suggested that the demand for a continuous, high-capacity seed-treater, able to eliminate dust in all phases of the process and to apply soluble or wettable fungicides or insecticides uniformly to all types of seeds, could best be met by the treatment of the seed with a spray during its passage through a revolving cylinder of sufficient diameter to allow good dispersion. A full-scale experimental unit was then constructed with all the elements requisite for the treating process, and with adjustable features for the determination of optimal conditions of operation.

The construction and operation of the treater are described and a full account is given of the completed tests, in which its performance was evaluated in respect of mechanical difficulties, uniformity of seed coverage, and the degree of protection afforded by fungicidal applications. The fungicides tested were phygon paste, spergon SL, isotox seed-treater, consisting of 75 per cent. pure lindane (pure γ isomer of hexachlorocyclohexane) as a wettable powder (supplied by the California Spray-Chemical Corporation), and arasan SF. The seeds used were dehusked sugar beet, double dwarf milo sorghum, and Wilbur baby Lima bean [*Phaseolus lunatus*]. With each of these the most uniform application was obtained when the drum axis was about 2° from horizontal. The maximum rate of flow for satisfactory coverage of sugar beet seed was about 3,300 lb. per hour. A 2 per cent. application of moisture was used in most of the beet seed runs, though slightly greater uniformity was secured when the same amounts of fungicide and Victoria Green aniline dye (for the visual assessment of the degree of coverage) were applied with 4 per cent. moisture. The only seed rate used for sorghum was 6,300 lb. per hour with 1 per cent. moisture. Satisfactory coverage of Lima bean seed was secured with both rates tested, viz., 0·5 per cent. at 8,100 lb. per hour and 0·25 per cent. at 11,000.

Samples from a number of the runs were planted in greenhouse flats in soils infested with *Pythium ultimum*, and the degree of protection measured by the emergence and survival of seedlings under conditions highly conducive to both pre- and post-emergence damping-off. In nearly every test the spray-treated seeds produced higher stands than the untreated. When sorghum seed infested by *Fusarium moniliforme* [*Gibberella fujikuroi*] was treated with phygon paste after a spray application of 75 per cent. isotox and then sown in pasteurized soil, almost complete control of seed-borne root rot was obtained. Sorghum seed, treated with isotox and phygon at dosages of $1\frac{1}{3}$ oz. and $\frac{1}{2}$ pt., respectively, per 100 lb. and planted in the field at the rate of 11 lb. per acre produced 9·4 seedlings per ft. of row compared with only 2·12 for untreated.

Nozzle pressures from 25 to 60 lb. per sq. in. proved to be satisfactory for the treatment of sugar beet seed, with its rough outer surface, while less than 25 can be used for smooth-coated seeds like beans. Small seeds are more difficult to treat than larger ones, since the likelihood of exposure during passage downwards through the spray zone are fewer. Uniformity of application improves considerably with a decrease in the volumetric seed rate and an increase in the drum speed up to 25 revolutions per minute. Uniformity is further enhanced by increasing the drum slope until a point is reached where the seed band becomes so thin as to lose its stability on the drum.

The principal advantages of the treater are uniform coverage, even on rough, absorbent seeds, such as sugar beet; protection of the operator from dangerous or obnoxious materials (a commercial unit now under construction will be completely enclosed to confine the spray); reduction of dust nuisance in subsequent handling of treated seed; and ease of complete emptying and cleaning, the drum being

self-cleaning while the seed meter can be emptied by merely lowering its hinged flap.

ZENTMYER (G. A.) & KENDRICK (J. B.). **Fungicidal action of volatile soil fumigants.**—Abs. in *Phytopathology*, 39, 10, p. 864, 1949.

A number of volatile soil fumigants were tested under sterile conditions in closed jars, with and without soil, to determine their fungicidal action on *Fusarium solani* f. *phaseoli*, *Phytophthora cinnamomi*, *Rhizoctonia* [*Corticium*] *solani*, and *Thielaviopsis basicola*. Three dosages were used for each substance, and the inoculum was removed and cultured after 24 hours' incubation at 24° C. Chloropicrin was the most effective, killing all four organisms at a dosage of 1·9 ml. per cu. ft., followed by ethylene oxide (all but *F. solani* f. *phaseoli* at 1·4 ml.), 1, 3-dichloropropene (all but *F. solani* f. *phaseoli* at 2·1 ml.), and dowfume N [*R.A.M.*, 27, p. 483] (all but *C. solani* at 2·1 ml.). Ethylene dibromide [ibid., 29, p. 194] killed *P. cinnamomi* at 2·1 ml. per cu. ft., but two to four times this amount was required to destroy the other fungi. Carbon disulphide was lethal to *C. solani* at 4·2 ml. and to the other pathogens at 8·4, while 1, 2-dichloropropane was ineffectual even at the latter rate. *P. cinnamomi* was the least resistant to the fumigants as a whole, followed by *T. basicola*, *C. solani*, and *F. solani* f. *phaseoli* in that order.

LITTLE (J. E.), SPROSTON (T. J.), & FOOTE (M. W.). **Synthesis and antifungal action of 2-methylmercapto-1, 4-naphthoquinone.**—*J. Amer. chem. Soc.*, 71, 3, pp. 1124, 1949.

The substitution of a sulphur atom for oxygen in the 2-methoxy-1, 4-naphthoquinone [*R.A.M.*, 27, p. 367] molecule resulted in a marked increase in anti-fungal activity. The LD 50 value for 2-methylmercapto-1, 4-naphthoquinone, tested against the spores of *Monilinia* [*Sclerotinia*] *fructicola* [see next abstract], was 1 p.p.m. as compared with 3·65 p.p.m. for 2-methoxy-1, 4-naphthoquinone. The solubility of methylmercapto-1, 4-naphthoquinone, determined spectrophotometrically, was found to be 7 mg. per l. at 26° C. Its insoluble nature should be advantageous in the treatment of fungal diseases of plants.

FOOTE (M. W.), LITTLE (J. E.), & SPROSTON (T. J.). **On naphthoquinones as inhibitors of spore germination.**—*J. biol. Chem.*, 181, 2, pp. 481–487, 2 graphs, 1949.

The molar concentrations of eight naphthoquinones required to produce 50 per cent. inhibition of carbon dioxide output from baker's yeast (*Saccharomyces cerevisiae*), and of spore germination (in *Sclerotinia fructicola*) [see preceding abstract] were determined as follows: 2, 3-dichloro-1, 4-naphthoquinone, 2·86 by 10^{-7} and 3·1 by 10^{-7}, respectively; 2-amino-1, 4-naphthoquinonimine mercuric chloride, 2·88 by 10^{-6} and 5·34 by 10^{-6}; 2-mercapto-1, 4-naphthoquinone, 4·8 by 10^{-6} and 5 by 10^{-6}; 1, 4-naphthoquinone, 4·24 by 10^{-6} and 62 by 10^{-6}; 2, 3-dimethoxy-1, 4-naphthoquinone, 46·3 by 10^{-6} and 22·8 by 10^{-6}; 2-methoxy-1, 4-naphthoquinone, 106 by 10^{-6} and 16·4 by 10^{-6}; 2-amino-1, 4-naphthoquinone, 205 by 10^{-6} and 52·5 by 10^{-6}; and 2-hydroxy-1, 4-naphthoquinone, 701 by 10^{-6} and >600 by 10^{-6}. For three substituted pyrazoles [*R.A.M.*, 29, p. 107] the LD 50 values for carbon dioxide output and inhibition of spore germination of *Alternaria solani* on tomato leaves were as follows: J49, 19·6 by 10^{-6} and 119 by 10^{-6}; 2K5, 36·7 by 10^{-6} and 140 by 10^{-6}; and 36L, 264 by 10^{-6} and 2,000 by 10^{-6}.

The parallelism existing between the quantities necessary to produce 50 per cent. inhibition of spore germination in *S. fructicola* and of carboxylase activity suggests that carboxylase is one of the points of inhibition of anti-fungal naphthoquinones. This activity might provide a rapid and dependable guide for the testing of certain anti-fungal compounds.

Proceedings. Mycological education.—*Trans. Brit. mycol. Soc.*, 32, 2, pp. 190–196, 1949.

In a discussion on mycological education at the meeting of the British Mycological Society held in London on 31st January, 1948, G. C. Ainsworth discussed the relationship of the Society to education [*R.A.M.*, 28, p. 531], W. G. Keyworth spoke on mycology for the plant pathologist, F. D. Armitage on mycology for the industrial microbiologist, I. Martin-Scott on mycology and the medical practitioner, and J. M. B. King on the needs of the amateur; C. G. C. Chesters dealt with mycology in the Universities and L. M. J. Kramer in schools.

Morstatt (H.). **Konstitution und Disposition bei Pflanzenkrankheiten.** [Constitution and disposition in plant diseases.]—*Biol. Zbl.*, 66, 11–12, pp. 396–401, 1947.

The concept of constitution and disposition in relation to plant diseases is discussed in the light of 14 contributions to the subject [cf. *R.A.M.*, 13, p. 253; 25, p. 173, *et passim*]. 'Constitution' is defined as the sum-total of the genotypically conditioned morphological and physiological characters, exemplified by the influence of origin on the cultivability of economic plants; 'disposition' (diathesis) as a specific reaction to disease, e.g., susceptibility to obligate fungal and insect parasites; and predisposition (condition) as phenotypical susceptibility to diseases enhanced by environmental influences, typified by facultative fungal and insect parasites.

List of plant breeders in Canada and the United States of America.—vii+64 pp., Washington, Food and Agriculture Organization of the United Nations, 1949. [Mimeoprinted.]

This publication, prepared by the Plant Industry Branch of the Agriculture Division, contains alphabetical lists of plant-breeders in Canada and the United States, their addresses, and the plants they are working with. Only breeders working in official institutions are listed.

Bailey (D. L.), Buckland (D. C.), Gordon (W. L.), Hagborg (W. A. F.), Macleod (D. J.), Tyner (L. E.), & Henry (A. W.). **Report of the terminology committee of the C[anadian] P[hytopathological] S[ociety].**—*Proc. Canad. phytopath. Soc.*, 17, pp. 8–9, 1950.

The Terminology Committee of the Canadian Phytopathological Society suggests that further improvements should be made in the definitions of the terms 'immunization', 'infected', 'inoculate', 'klendusity', 'pathogenic', 'resistance', and 'virulent', which appear in the list of definitions submitted by the Committee on Technical Words (*Phytopathology*, 30, pp. 361–368, 1940) [cf. *R.A.M.* 23, p. 139]; and that the list should be extended. The Committee also recommends that the appropriate section of the International Botanical Congress should be urged to take suitable action with regard to the terminology of plant pathology.

Waksman (S. A.). **Streptomycin. Nature and practical applications.**—ix+618 pp., 48 figs. (1 col.), 3 diags., 44 graphs, Baltimore, Williams & Wilkins Co., 1949, [£3. 16*s.* 6*d.* from Baillière, Tindall & Cox.]

This treatise falls into four sections, namely, (I) microbiological and chemical aspects (chapters 1 to 6); (II) antibacterial and pharmacologic properties of streptomycin (7 to 15); (III) clinical uses of streptomycin (16–41); and (IV) miscellaneous uses of streptomycin (42 to 46). S. A. Waksman is responsible for chapters 1 and 2, the former entitled 'historical introduction' and the latter '*Streptomyces griseus*, nature and nutrition', while the remainder are contributed by a number of other authorities on different aspects of the subject.

In the final chapter P. A. Ark discusses the use of streptomycin in phytopathology where it may be effective in the control of bacterial diseases [*R.A.M.*, 26, p. 18; 27, p. 276]. Cucumber seeds soaked in concentrations of streptomycin ranging from 1 in 10,000 to 1 in 1,000,000, dried at room temperature, and placed on plates seeded with *Pseudomonas lacrymans* showed antibiotic activity. The viability of the seeds was not affected by soaking in streptomycin for 24 hours or longer. The presence of the streptomycin was demonstrated in the embryos of the treated seeds, and after two months' storage at room temperature they still contained the antibiotic as shown by assay with *P. lacrymans*. Under greenhouse conditions streptomycin appears to remain stable long enough to give some control of *P. punctulans* on tomato.

Cucumber seeds, field-contaminated with *P. lacrymans*, were used in greenhouse experiments, and tomato seeds, field-contaminated and artificially contaminated with *Corynebacterium michiganense*, were used in a field trial. The seeds were soaked in streptomycin solution (1 in 10,000) for 20 minutes, and dried before sowing. At the end of the experiment the cucumber plants from seeds treated with streptomycin showed no infection, as against 5 per cent. in the controls. The tomatoes from the treated seed developed no canker, whereas the controls developed 60 per cent.

Harris (H. A.). **Antibacterial activity of seedling extracts of cultivated plants.**—*Bull. Torrey bot. Cl.*, 76, 4, pp. 244–254, 1949.

At Colorado University seedling extracts of 145 different species and varieties of cultivated plants [*R.A.M.*, 23, p. 220; 26, p. 350; 27, p. 576] belonging to 37 different families were tested *in vitro* for antibacterial substances, using four test organisms. Approximately 12 per cent. of the seedling extracts had antibacterial properties: the use of seedlings is of value for preliminary screening tests.

Houlahan (Mary B.), Beadle (G. W.), & Calhoun (Hermione G.). **Linkage studies with biochemical mutants of Neurospora crassa.**—*Genetics*, 34, 5, pp. 493–507, 1949.

At the Kerckhoff Laboratories, Pasadena, California, spores from 330 crosses involving 118 mutants of *Neurospora crassa* were isolated in order from 8,549 asci. The types of segregation observed are tabulated for each cross, and 69 genes, representing at least 35 different loci, were placed in five linkage groups.

Ottke (R. C.). **The occurrence of ergosterol in Neurospora crassa.**—*Arch. Biochem., N.Y.*, 23, 1, pp. 49–50, 1949.

The principal sterol of *Neurospora crassa* [*R.A.M.*, 25, p. 310] has been isolated and identified as ergosterol. Its concentration in the mould, grown on 2 per cent. sucrose at 30° C. for four days, was about 0·13 per cent. of the dry mycelial weight.

Randhawa (G. S.) & Hamner (C. L.). **The effect of antibiotics and growth regulators on germination of several seeds with special reference to actidione.**—*Indian J. Hort.*, 6, 3–4, pp. 1–5, 1949.

In tests [at Michigan State College] wheat, radish, and Red Kidney bean [*Phaseolus vulgaris*] seeds were soaked for four hours in a mixture of solutions of nine antibiotics (streptomycin sulphate, streptothricin, streptolin, antibiotic Q–19, polymyxin, bacitracin, antibiotic 136–B, streptomycin-B-sulphate, and penicillin). No inhibiting effect upon germination occurred, but when actidione [*R.A.M.*, 28, p. 635] was added to the mixture its inhibiting action was greatly increased. A combination of growth regulators with the antibiotics (other than actidione) reduced the inhibiting effects of the former.

KAVANAGH (F.), HERVEY (ANNETTE), & ROBBINS (W. J.). **Antibiotic substances from Basidiomycetes. V. Poria corticola, Poria tenuis and an unidentified Basidiomycete.**—*Proc. nat. Acad. Sci., Wash.*, 36, 1, pp. 1–7, 1 graph, 1950.

Two active antibacterial substances, both produced by *Poria corticola* and *P. tenuis* (*Bull. Torrey bot. Cl.*, 72, pp. 165–190, 1945), are named nemotin and nemotinic acid. They were also produced by an unidentified Basidiomycete, B841, isolated from white cedar [*Chamaecyparis thyoides*]. Nemotin and nemotinic acid prepared from B841 showed considerable fungistatic activity, inhibiting a wide range of test organisms.

KAVANAGH (F.), HERVEY (ANNETTE), & ROBBINS (W. J.). **Antibiotic substances from Basidiomycetes. VI. Agrocybe dura.**—*Proc. nat. Acad. Sci., Wash.*, 36, 2, pp. 102–106, 1 graph, 1950.

Further investigations in this series [see preceding abstract] showed that agrocybin, a crystalline, antibiotic substance isolated from culture liquids of *Agrocybe* [*Pholiota*] *dura*, inhibits Gram-positive, Gram-negative, and acid-fast bacteria. The antibacterial activities resemble those of biformin [*R.A.M.*, 26, p. 556], though agrocybin is more active against some bacteria; it is also much more active against the Gram-negative bacteria than the chemically closely related nemotin A [see preceding abstract]. When measured by the serial dilution method the concentrates were about one eighth to one quarter as active against seven test fungi as against *Staphylococcus aureus*.

MEHTA (P. S.). **Mildew in Cotton textiles.**—*Indian Text. J.*, 59, 705, pp. 798–800, 1 graph, 1949.

The following very severe test is applied at the Hind Mills Ltd., Bombay, to the evaluation of antiseptics for mildew control in cotton textiles. Two 1-in. sq. cuttings are placed in a desiccator jar over 'mildewed water' and inoculated with a drop of the water. Observations are made at four- to six-day intervals, the jar being kept in the dark. Under these optimal conditions for mildew growth, an antiseptic is rated as suitable for its purpose if no mould development occurs in 72 hours, and as very efficient if none is present after 92 hours.

This test should be made every week throughout the year, since the fungicidal properties of the antiseptics vary with temperature and climate. The results of its application during the last few years have shown that shirlan paste is effective except at high temperatures. Salicylic acid, carbolic acid (phenol), and zinc chloride were rated as unsatisfactory. Beta-naphthol [*R.A.M.*, 25, p. 177] proved an efficient antiseptic against mildew, a concentration of 22 oz. per 200 lb. solid starch sufficing to prevent infection for the requisite 96-hour period. Beta-naphthol is insoluble in cold water, and only very slightly soluble in hot, and the best method of solution is to add 22 oz. of the compound to the same amount of boiling water, with constant stirring, then slowly pouring in 30 oz. caustic soda solution until a clear brown solution is obtained.

STAHL (B. F.) & SMITH (H. L.). **Treatment for prevention of decay in stacked straw.**—*Paper Tr. J.*, 125, 24 (Tech. Sect.), pp. 296–298, 1947.

Losses of stacked straw due to rot and decay by micro-organisms, including *Actinomyces*, *Aspergillus*, *Trichoderma*, *Fusarium*, *Botrytis*, and various yeast-like fungi, are estimated to range from 5 to 15 per cent. in bales exposed to sunlight, heat, and rain. Experimental data assembled at the Terre Haute Paper Company, Indiana, showed that considerable savings could be effected by spraying the surfaces of the stacks with sodium pentachlorophenate at the rate of about 1 lb. per 7 sq. ft.